The Chemical Age

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Notes and Comments

The Duty on Heavy Oils

THE duty of 1d. per gal. or just over £1 a ton, which has been levied on heavy oils imported into this country has been received with mixed feelings. The makers of oil-burning appliances are, quite naturally, determined to make out the best case they can against the tax. The purveyors of coke and gas, to say nothing of coal, find in the tax a golden opportunity of pointing out how easily their fuels can take the place of the more expensive oil. Many of the users of oil, who perhaps have just spent no small amount of money in altering their furnaces to burn oil instead of coal, now find that they have made a miscalculation, and endeavour to move the blame on to the shoulders of the Government. The tax, however, must be judged on the national rather than individual basis. To say, as has been said, that the tax should be remitted because a certain number of large retail shops have begun to burn oil instead of coal savours of the *reductio ad absurdum*. In plain fact we must ask why individuals have commenced to burn oil instead of coal. In many instances, particularly in the case of non-manufacturing installations, the answer has been " to save money by reducing labour." For the minor saving achieved by the individual, however, the rest of the country is committed to keep an increasing number of families on the dole. The country as a whole thus loses heavily on the deal.

A Fillip to British Industry

THE British fuel oil industry, principally that of low temperature coal carbonisation—a purely chemical industry—will receive a much-needed fillip. The production of oil from coal, though frequently dismissed contemptuously as being too greatly mixed up with the past financial jugglery of the low temperature coal carbonising industry, is in reality one of the most pressing problems of our generation. We are dependent for oil to-day upon foreign oil-fields. Our Navy, for urgent and sufficient reasons connected with radius of action, quick fuelling, and percentage of personnel employed as stokers, has been inevitably and irretrievably committed to oil fuel. For our safety we are dependent upon the long, weak line of communication between this country and the British-controlled oil-fields of Iraq. The production of oil fuel at home is a pressing problem for our chemists, and it is a problem not only of research but also of plant equipment. Such a problem demands for its solution a strong and firmly established home oil industry.

Whilst there is little or no justification for burning oil in furnaces in preference to coal, to gas, or to other home-produced sources of energy, there is room for honest doubt about the wisdom of taxing all heavy oil impartially when the internal combustion engine is considered. The development that has taken place in the Diesel engine, however, cannot well be arrested, and the lower price of heavy oil as compared with petrol will continue to encourage efforts in this direction. The tax on petrol, high as it is, does not seem to have slowed down development in motor traffic. We remain unconvinced that the new tax will seriously affect the development of the Diesel engine, whilst it will give a stimulus to improving the efficiency of that machine. It is too often tacitly assumed by those who would supplant " old King Coal " that little improvement has been made in the art of burning coal—and coke—since the days of George Stevenson. Those who take the trouble to inquire what can be done to-day in the way of increased efficiency, thermostatic control, mechanical handling, and so forth, will be astonished by the progress that is being made. The difference between the home-produced article and the foreign article is largely one of publicity. Many people have expended considerable capital in changing their heating systems to oil. Suddenly, over-night, and without *definite* warning, the advantage they had hoped to gain have been nullified, or possibly turned into positive disadvantages. There are certainly reasons for insisting that the provisions of the Budget should—under the present rules of the import-duty game—be kept secret until all chance of pre-tax dumping has become impossible, but it should not be beyond the power of the human brain to devise some means of avoiding wasteful expenditure of this character.

Fertilisers and Crops

THE successful manufacturer must do more than manufacture. He must also sell his goods, and in order to sell under modern conditions he must know more about the uses and potentialities of his products than do the users themselves. Research must therefore be used as an adjunct to the sales force as well as to the manufacturing side of his business. Recent public discussion on agriculture has lent point to this statement. One of the difficulties of farming lies in its uncertainty. the advantages that would accrue from a sound method of forecasting crop yields are manifold, and of these not the least, as pointed out by Dr. E. J. Russell, is that farm production, while still as great a risk as ever, would become an insurable risk. It is suggested that, as part of the insurance scheme, fertiliser manufacturers might guarantee to farmers using their fertilisers that the yields would not fall below a certain level or, if they did, the difference in value would be paid.

The reactions of the fertiliser manufacturers to Dr. Russell's suggestion are not likely to be favourable. The first impulse will no doubt be to describe it as ridiculous. Further reflection, however, discloses that the suggestion is definitely in accord with modern tendencies and is one to which manufacturers must pay heed lest in days to come they suddenly find themselves faced with a demand which they themselves cannot meet, but which the manufacturers of foreign fertilisers are prepared to undertake.

A manufacturer who buys a piece of plant or other apparatus does not do so because he likes the colours in which it is painted, or the artistic lines of its contour—he buys it on the definite guarantee that it will give certain predictable results. The predictability of the results is the care of the manufacturer not of the user. If those results are not obtained the manufacturer is not infrequently liable to pay a monetary penalty. The case for guaranteeing yields from fertilisers is exactly analogous. The farmer does not buy his fertiliser because he likes to possess material containing not less than x per cent. of nitrogen, but because he reasonably expects that the use of such material will give certain yields of products, in other words, "certain predictable results." Again the predictability of the results must be the care of the manufacturer. As in the case of the machine or plant, the guarantee depends on fair conditions and proper use. It is in relation to the conditions and methods of use that work is required. What guarantee is there that the fertiliser has indeed been used properly and in the right proportions? It would be impossible to inspect every application of fertiliser. Can subsequent analysis of the soil show whether the fertiliser has been applied properly? We doubt whether it ever could be so unless the soil was analysed before application as well. The chemical and analytical work required in the insurance offices would in this case be enormous. The conditions, moreover, are not under the farmers' control. The effect of the weather and of insects and birds may mask that of the fertilisers. The nature of the soil may affect the yields more than the fertiliser, and a guarantee applicable to one farm may be off the mark when applied to a neighbouring farm. Imperial Chemical Industries, however, have now taken the lead by applying fertilisers to their own farms in order to study results. The British Sulphate of Ammonia Federation must evidently do likewise and so also must the nitrate producers and all other fertiliser suppliers. It would be interesting to hear the views of manufacturers upon this proposal. The objections may prove to be much less vital than they appear at first sight and if so, manufacturers must examine, in collaboration with Rothamstead, all the problems to which the proposal gives rise.

The German Trade Agreement

GOVERNMENT methods, as affecting the chemical industry, were severely criticised by Sir William Alexander during the committee stage of the German Trade Agreement in the House of Commons on May 1. He said he had no hesitation in stating that the implications of this agreement had caused the widest apprehension and fear throughout the whole manufacturing industry. Duties imposed as a result of the Ottawa Agreements, and also on the recommendation of the Import Duties Advisory Committee, are seriously prejudiced. This agreement, moreover, seems to have been made without the slightest consultation with any of the associations connected with industry or with any firms. It singles out few industries to furnish the concessions for an illusory advantage in coal. Most surprising of all, is that on the chemical side the whole range of chemicals, or even a comparatively small range, has not been accepted. It has been limited to a group of four, which are the particular products manufactured by the largest chemical organisation in Germany. Of these acetic acid, acetone and formaldehyde, were of comparatively small amount before the war and were then entirely in the hands of the foreigner. To develop fresh outlets for their products and maintain employment in their distilleries, the Distillers Company decided to embark on the most up-to-date synthetic chemical processes for the production of acetic acid, acetone and formaldehyde, and other solvents from alcohol, and involved themselves in a large capital expenditure on buildings, plant, machinery, etc. Imperial Chemical Industries have also committed themselves to the expenditure of large sums for the manufacture of new products in this country, one of the most important of which is acetic acid. These industries have been started and developed during a period of crippling taxation, fierce world competition and other handicaps, but, with the assistance given to them by the Import Duties Advisory Committee of $33\frac{1}{3}$ per cent. on these specific products, they have progressed. The two companies have a capacity of 12,000 to 15,000 tons of acetic acid per annum, but due to German material still coming into this country, notwithstanding the $33\frac{1}{3}$ per cent. duty, these factories to-day are only working at 25 per cent. of their capacity.

The Case of Formaldehyde

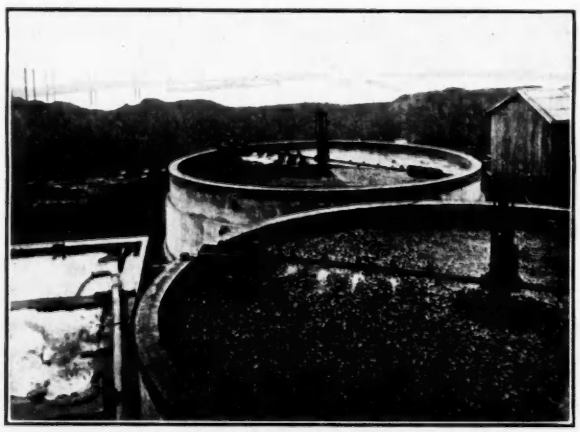
FORMALDEHYDE, said Sir William, is a comparatively new industry to this country since the war. He had interested himself in the largest factory in the country. Owing to fierce competition from Germany and to extensive dumping, this company was compelled in 1932 to approach the Imports Duties Advisory Committee for assistance, and, with promptitude and business efficiency, it was decided to recommend a duty of $33\frac{1}{3}$ per cent. But, as happens with the Import Duties Advisory Committee, the trade was consulted, and before the $33\frac{1}{3}$ per cent. duty was placed upon the imports of this product, certain guarantees were obtained from the company. Following the fulfilment of these definite obligations of a sound business nature this particular company reports that they have found it necessary, due to increased business, already to increase plant capacity in two stages by 60 per cent., and they are now considering further extensions, as their plant is working 24 hours daily, seven days a week. Costs have been reduced accordingly, and to-day they are selling their products below the prices ruling when they met intense foreign competition and before the duty was placed upon the commodity. This growing industry, moreover, has encouraged the company to go a step further. The company has plans and schemes under consideration at the moment for the erection and equipment of another factory, thereby ensuring more employment, but if the German Trade Agreement is ratified in its present form these schemes will be abandoned as a result of Government folly.

Beet Sugar Factory Effluents

Biological Oxidation as a Means of Purification

IN Water Pollution Research Technical Paper No. 3 (H.M. Stationery Office, price 7s. 6d. net) the Department of Scientific and Industrial Research has now given the results of an intensive investigation on the purification of waste waters from beet sugar factories which has been in progress for some years. Towards the cost of the investigation a substantial contribution has been made by the industry through a Beet Sugar Factories Committee specially formed for the purpose of co-operating with the D.S.I.R.

It is only during the past ten years that the beet sugar industry has been developed on any extensive scale in this country. The quantity of beet sugar manufactured in Great Britain during 1922-23 was little more than 140,000 cwt., but with the advent of financial assistance from the Government the quantity began to increase and in the season 1930-31 it had risen to nearly 10 million cwt. The processes employed in the factories involve the use of very large quantities of



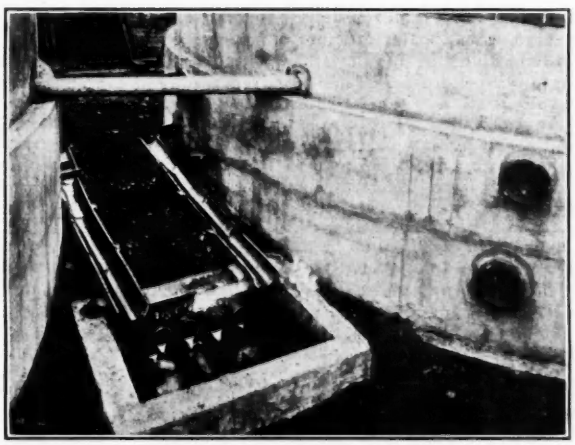
Filters of Experimental Purification Plant at Beet Sugar Factory, Colwick, 1928-29

water, of the order of 3.5 million gallons per 1,000 tons of beet extracted or per 3,000 cwt. of sugar produced, and in most instances volumes of waste water of this order have been discharged into the adjacent rivers and streams. Even after the removal of solid matter in suspension, by sedimentation in ponds or by other methods, the waste waters from certain of the factory processes are highly polluting and have a serious detrimental effect on any stream into which they are discharged, unless the flow of the stream is comparatively large and affords a high dilution. The polluting character of the effluents from factories on the Continent and in America had long been recognised, and many attempts had been made to evolve methods of purification, but without much success. In most cases, owing to the large flow of the rivers concerned, no ill consequences had resulted from the discharge of imperfectly purified effluents, but with the growth of the industry in Great Britain, where the rivers generally are smaller than on the Continent and in America, several cases of serious pollution of streams adjacent to factories soon arose and it was realised that this pollution could not be avoided unless the manufacturing processes were so altered as greatly to reduce the quantities of polluting matter discharged or some practicable means of purifying the effluents could be developed.

Early in 1927, at the suggestion of the Ministry of Agriculture and Fisheries, the Department of Scientific and Industrial Research therefore arranged for preliminary experiments to be carried out at the Rothamsted Experimental Station. Three possible means of purification, namely, fermentation with additions of lime, biological oxidation on percolating filters, and bio-aeration with an activated sludge were first tested on the laboratory scale. These preliminary experiments led to the conclusion that fermentation with lime was not in itself satisfactory. Biological filtration yielded promising results and the purified effluents obtained under certain conditions attained a standard sufficient to satisfy the tests recommended by the Royal Commission on Sewage Disposal. Bio-aeration with an activated sludge also gave good results, but the prospects of the method as a large scale proposition seemed to be less promising than those of the process of biological filtration.

Re-Use of Waste Waters

As a result of the first part of their inquiry, the Water Pollution Research Board, which was set up by the D.S.I.R. in June, 1927, concluded that the problem could be largely and in many cases completely solved by modifications in the factory processes and by simple methods of treatment of the waste waters such that the waters could be re-used in the factory. This conclusion and suggestions for the re-use of the waters were at once communicated to the industry, although prior to the beet sugar season of 1928-29 several factories had made modifications in their methods of operation or had adopted processes for the re-use of water, with consequent reduction in the amount of effluent discharged. Since that time several authorities in the industry have expressed the opinion, as a result of experience, that, in addition to preventing pollution, the costs of making the necessary modifications for the re-use of part of the water are at least counterbalanced by resulting economies. It was appreciated, however, that before the maximum re-use of water could be



Arrangement of Effluent Outlets and Side Sampling Pipes on Filters at Beet Sugar Factory, Colwick, 1928-29

achieved by the industry as a whole, a certain amount of reorganisation in a number of the factories would be required. There was also the possibility that even after re-organisation it might be necessary on occasion to discharge a proportion of the waste waters. Further, some factories may prefer, for various reasons, to purify the wastes sufficiently to allow of their discharge into the river, rather than to re-use the waters. After preliminary laboratory experiments at the Rothamsted Experimental Station, the Water Pollution Research Board concluded that the process of biological oxidation on percolating filters showed the best promise of success as a method of purification, and arrangements were made for large experimental filters to be constructed at the beet sugar factory at Colwick, near Nottingham, where facilities for investigation on the semi-commercial scale were afforded through the kindness of The Anglo-Scottish Beet Sugar Corporation, Ltd.

The present report shows that a high degree of purification, of the order of 90 per cent. for press water, the most polluting of the factory effluents, can be attained by the process of biological oxidation on percolating filters. At the same time the conditions necessary for this high degree of purification have been ascertained. Treatment of the effluents by oxidation on percolating filters was systematically studied not only in its chemical but also its biological aspects. The organisms

present in the filters included bacteria, fungi, yeasts, algæ, protozoa, rotifers, nematodes, insect larvæ and oligochaetes. Many hundreds of strains of bacteria were isolated for physiological study in the laboratory, and the investigation in this direction has been one of the most thorough of its kind. The information contained in the report, which includes a large number of diagrams and tables of results, should therefore be of value not only in dealing with problems of purification of beet sugar factory effluents but also in attempts to devise or improve methods of treatment of other polluting effluents, such as domestic sewage and wastes discharged from dairies, creameries and jam factories.

Semi-Commercial Scale Experiments

The Anglo-Scottish beet sugar factory, at Colwick, was built to treat 1,000 tons of beet per day, the beet being extracted by the intermittent process in a battery of diffusers. The effluents produced include 250,000 to 500,000 gallons from the pulp presses and the diffusers, and about 3,000,000 gallons of fluming and washing water per day; these effluents were usually mixed and passed through sedimentation ponds before being discharged into the River Trent. The flow of the river past the factory in winter may be of the order of 1,000,000 gallons per minute with an average flow for the year of 500,000 gallons per minute. The average dilution of the factory effluent by river water was therefore 1 in 200.

The aim of the semi-commercial scale experiments carried out at Colwick was to obtain exact information on the composition of press water and of fluming and washing water and to ascertain the most suitable conditions for the treatment of these effluents on a factory scale by the process of biological oxidation on percolating filters. In the plant as first erected, the pulp press water required for the experiments was delivered from the factory into a measuring tank, and the required volume of fluming and washing water, from which the larger suspended solids had been removed, was delivered into a second similar tank. The rates of supply to these tanks were controlled by valves on the delivery pipes. In both tanks the liquids passed through V-notches and the rates of flow were measured by Lea recorders. After leaving the measuring tanks the liquids were allowed to mix by entering a common delivery pipe to a Dortmund settling tank. This tank, constructed in concrete, was of square horizontal section with vertical sides in the upper half. The lower half was shaped like a funnel, the sides tapering almost to a point at the bottom, where an outlet was connected for the removal of sludge. A wooden shaft of square section was supported centrally to reach from the top of the tank to the level at which the sides of the tank began to taper inwards. Liquid enters at the top in the middle of the shaft, flows downwards within the shaft and then upwards between the shaft and the wall of the tank. Deposited solid matter collects on the sloping sides and accumulates at the bottom of the tank, whence it is periodically withdrawn and the clarified liquid leaves the tank at the top. The tank employed at Colwick was of 3,500 gallons capacity, which allowed nearly four hours' settlement at the usual rate of flow of 100 g.y.d. to the filters. At this rate the crude liquor had an upward linear velocity in the settling tank of slightly less than 2 ft. per hour; after settlement it was passed through two gauging chambers fitted with V-notches and Lea recorders, and then to the filters.

Biological Oxidation

The percolating filters consisted of two circular concrete tanks, each 25 ft. in diameter and 6 ft. in depth; they were divided diametrically to make four filters each with a volume of 54 cu. yards. The crude liquor was distributed over each pair of filters by means of a revolving sprinkler, and to test the uniformity of distribution at different rates of flow a number of trays of equal surface area were placed on different parts of the surfaces of the filters and the volumes of liquid caught by the trays in one, two and three revolutions of the sprinklers were measured. From the results obtained it was evident that a minimum flow of about 100 g.y.d. was necessary to ensure an even distribution of liquid over the filters; at this rate the plant was able to filter 21,600 gallons of liquor per day.

The semi-commercial scale experiments carried out at Colwick during 1927-28 and 1928-29 demonstrated that a mixture of press water and fluming and washing water can be satisfactorily purified by the process of biological oxidation in percolating filters, containing suitable media of sizes ranging between $\frac{1}{4}$ in. and $1\frac{1}{2}$ in. With media smaller than $\frac{1}{4}$ in., the deposition of suspended solid matter carried by the mixture led to clogging of the filters and resulted in a reduction in the amount of purification obtained. It was considered that the use of fluming and washing water as a diluent for press water was one of the factors which prevented the successful operation of the filters containing fine media. By quiescent settlement for three hours, however, the suspended solids in fluming and washing water can be reduced to about 25 parts per 100,000, but an appreciable reduction of suspended solids below this figure requires a much longer time of settlement. It was therefore decided to continue the semi-commercial scale experiments during 1929-30, but to dilute the press water with effluent from the filters instead of with fluming and washing water. Here the main object was to reduce the quantity of suspended solid matter carried to the filters. Effluent from the filtration plant was chosen in preference to condenser water or river water partly because it was readily obtainable at Colwick, but mainly because in a factory in which arrangements could conveniently be made to re-use condenser water and fluming and washing water, the volume of effluent to be discharged would be reduced to that of the press water.

The experiments at Colwick demonstrated that the process of biological oxidation on percolating filters can be operated on a large scale to effect a high degree of purification. The conditions necessary to achieve 90 per cent. purification of diffusion and pulp-press water on percolating filters of a depth of about 6 ft. are that the waste water should be subjected to sedimentation to remove the major portion of suspended solid matter and diluted to give a liquid equivalent in strength to a solution containing about 0.1 per cent. sucrose, dilution being effected by river water, effluent from the filters or transport and washing water; and that the diluted waste water should be filtered at a rate not exceeding 100 or 150 gallons per cubic yard of filtering material per day. The most suitable medium for the filters was found to be a hard insoluble material such as gravel, flint or slag, the material being graded to a size of about $\frac{3}{8}$ in. to 1 in. and free from dust.

British Trade Openings in Spain

Demand for Plastic Materials

ACCORDING to a report on economic conditions in Spain issued by the Department of Overseas Trade (H.M. Stationery Office, price 2s.), there are opportunities existing in many directions for the expansion of British trade in Spain. In addition to the possibility that British goods should take the place of similar goods at present imported from other sources of supply, there is a large and hitherto almost unexplored field in the goods made from new materials or involving new applications of materials already in use. One of the directions which has been best explored in this connection is the use of plastic materials, for example, in stationery articles, toilet requisites, tea table articles, ornaments and fancy goods, where these substances have been efficiently and in some cases very artistically employed. This use of moulded substances, in many cases with a colourful and beautiful finish, in articles thus brought into every-day use, is capable of extension, and there is no reason why the United Kingdom should not hold a large part of the trade.

Although trade with the United Kingdom in pure chemicals has decreased since 1932, the percentage of imports of organic colouring matters having decreased by 9 per cent., there are many opportunities for the development of trade in the allied industries. Leather substitutes in the bookbinding, upholstery and other trades show possibilities of further expansion, whilst colours of various kinds made from a basis of cellulose are rapidly attaining a distinct hold in the Spanish market.

It is along these lines that expansion of United Kingdom trade in world commerce can, it is suggested, most profitably be sought. The United Kingdom, with her trained industrial population and her energetic business administrators, is equipped to take advantage of these opportunities, and if efforts be directed along these lines, she will still keep her place in the trade of the world.

Work at the National Physical Laboratory

Colorimetric Standardisation Acquires Increasing Importance

In the Report of the National Physical Laboratory for 1932 (H.M. Stationery Office, price 14s. net), it is pointed out that many industrial processes now require not only a furnace in which high temperatures can be maintained, but one in which the precise degree of heating is under control. It therefore becomes essential to have some standard scale to which very high temperatures can be referred. Work on an international scale of temperature has been in progress at the laboratory for a number of years and one of the points which serve to fix this scale at the higher temperatures is the melting point of platinum. Considerable attention has been devoted to the accurate determination of this temperature during 1932. Whereas a book of tables published less than 50 years ago gave estimates of this melting point varying from 1,460° C. to 2,534° C. the investigation now proceeding is expected to result in a value reliable to about 2° C.

Humidity Measurements

The measurement and control of moisture in the air are rapidly growing in importance in many industries. Spinning and weaving sheds are no longer restricted to localities where the climate is suitable, since plant is procurable to control the humidity in any building. Timber seasoning is now usually conducted in special kilns instead of in the open air, whilst in the conveyance and transport of frozen meat, the humidity must be carefully controlled if the food is to arrive in the best condition. The growth of interest in this subject is reflected in an investigation recently completed at the laboratory, whereby tables have been provided enabling the wet and dry bulb hygrometer to be used between 40° C. and 100° C. These tables have already been adopted in industry. The hygrometer is also being studied at lower temperatures. Below 0° C. the wet bulb becomes coated with ice, but it does not seem that this should invalidate its indications. A more serious difficulty is that the difference between the wet bulb and dry bulb temperatures becomes extremely small, so that the instrument is not very accurate at low temperatures. An effort to remedy this defect is being made by the development of electrical methods for measuring directly the difference between the temperatures of the wet and dry bulbs.

Colorimetry

The work on colorimetric standardisation carried out at the laboratory continues to acquire increasing importance with every fresh application to matters affecting the everyday life of the community. A few years ago the application of measurement to colour was of interest only to a few experts in the colour industries; nowadays the man-in-the-street, unknown to himself, profits from it in numerous ways. He can now buy standardised paints: he can travel by rail with the increased security afforded by the fact that the driver is guided by signals whose colours are specified within standard limits: he is rapidly becoming accustomed to having his movements by road controlled by light signals whose colours have to be carefully standardised to minimise the possibility of confusion: and in many less direct but equally important ways he benefits from the improvements which are being effected in the quality and adaptability of the products of the colour industries by the increasing use of scientific methods of measurement in their research laboratories. The basis of all such work in this country is the system of colour standardisation developed and maintained at the National Physical Laboratory, where the colour measuring instruments used in other laboratories can be standardised, and where the work of fixing public standards has been carried out.

Hardness Tests on Thin Metal Coatings

A description is given of an apparatus which has been developed at the laboratory whereby hardness tests can be carried out on very thin coatings such as chromium plate. With this instrument accurate hardness tests can be made on deposited coatings only 4/10,000 inch thick. Hardness tests on electro-deposited metal coatings have not hitherto been possible, and the method is already proving of value in industry.

Experiments have been continued on a series of oils to determine the maximum temperature at which they can be run under various conditions of load, speed and clearance. Experiments have been made upon a bearing which oscillates instead of rotating, similarly, to the small end of the connecting rod of a motor car engine. It is found that the friction under these circumstances is less than that of a bearing rotating at the same angular speed and that the oil film is not readily broken. This may account for the long life of such bearings on an internal combustion engine notwithstanding the difficulty of lubricating the gudgeon pin within the piston.

X-Rays in Metallurgical Research

The X-ray method of investigation is now in constant use in the Metallurgy Department for the determination of the structure of metals and alloys and of the changes which they undergo during thermal and mechanical treatment. During 1932 this method has proved of great value in the study of the alloys of iron and manganese, and also in that of the amalgams used in dental work. The equipment has been extended by the addition of an apparatus for applying the method of electron diffraction to metal surfaces; this is equivalent to using rays of a very much shorter wave-length than X-rays, and has the advantage that as the penetrating power of the ray is very small it is possible to study the structure of surface films independently of the underlying metal.

Work on the removal of gases from molten metals with the object of producing sound castings has shown the great importance of thin films of oxides, and occasionally of other compounds, on the surface of the molten metal, often preventing the free passage of the gas. On this account researches are in progress on the nature and process of formation of such films; tin, bismuth and aluminium are under investigation at present, clean specimens of the metals being melted in vacuo, and oxygen then being admitted under definite conditions. Not only the composition but also the texture of the oxide film thus formed has a great effect on the penetration of gases; although such films are extremely thin their mechanical strength is remarkably high, so that the effect produced by them on certain metals is similar to that of enclosure of the molten metal in an impermeable skin offering a high resistance to the passage of gases.

Light Alloys

The development of the light alloys of aluminium which find wide application in many branches of engineering, but more especially in aircraft construction, owes much to the work carried out at the laboratory in past years. During 1932 the research work has dealt largely with the removal of gases, with the object of obtaining sound castings. It has been found among other things that welded joints made from sheet material which had previously been freed from gas by suitable chemical treatment have much better mechanical properties than those made with untreated metal. Tensile strengths of the order of 20 tons per sq. in. with an elongation of 6 per cent. to 8 per cent. on 2 inches have been obtained from heat-treated welded test-pieces from which the surplus weld metal has been machined away. Magnesium is much lighter than aluminium, and the initial difficulties in the manufacture of light alloys from this metal have been largely overcome. Beryllium, one of the lightest of all metals, having at the same time the advantage of a high melting point, might be expected to give useful alloys with magnesium; but rather unexpectedly it has been shown that magnesium and beryllium do not alloy with one another. Magnesium of a high degree of purity is now prepared by distillation, the impurities being left in the non-volatile residue and the proportion in the distilled metal being reduced to as low as 0.03 per cent.

In the further pursuance of research into the causes of failure of boiler plates in practice attention has been given to the action of alkaline solutions under high pressure on steel; accumulations of caustic soda frequently occur in boilers under certain conditions of working. In order to study this effect a special apparatus has been constructed in which specimens of boiler plate can be kept under stress while exposed to the action of caustic soda solution at boiler temperatures in a high pressure vessel.

Plastics of the Celluloid and Casein Types

Mr. Foster Sproxton Lectures at the Plastics Industrial Exhibition

CELLULOID and casein types of plastics and their uses was the subject of a lecture delivered by Mr. Foster Sproxton in the Science Museum, South Kensington, on April 26, in connection with the Plastics Industrial Exhibition.

Mr. Sproxton said that celluloid could perhaps claim to be the oldest of the industries in which applied chemistry was used to produce a plastic substance. Samples in excellent preservation which were made 40 years ago were shown. Cellulose acetate plastics were more recent and although they had been produced commercially for 25 years it was only in the last 10 years that they had become widely known. The casein plastic industry dated back to 1900. Celluloid consisted essentially of about three parts by weight of nitrocellulose to one part of camphor; cellulose plastics consisted essentially of cellulose acetate and one or more of several plasticisers; casein plastics consisted essentially of casein which had been plasticised by water and heat and hardened by the action of formaldehyde. The present annual output of celluloid sheets, rods and tubes was 40,000 tons; that of cellulose acetate plastics was not known; that of casein sheets, rods and tubes was 10,000 tons.

Manufacture of Nitrocellulose

Turning to the manufacture of nitrocellulose, Mr. Sproxton said it was discovered in 1838 that cellulose could be made to combine with nitric acid, and it was later discovered that the product dissolved in a mixture of ether and alcohol. This solution, still known as collodion, was first suggested in 1848 as a protective dressing for wounds, and in 1851 the use of it as a basis for photography was established. Films of nitrocellulose, however, were not a plastic material suitable for moulding, they contracted considerably on drying and were hard and crackly. In the fifties, Alexander Parkes, of Birmingham, set to work to overcome what he called the contractile tendency of nitrocellulose. In 1864 he disclosed in a patent the use of camphor for this purpose. Parkes was too busy to give enough attention to a manufacture which was full of pitfalls and the early development of celluloid was carried out by the Hyatt brothers in the United States. The industry later came back to this country and had been fairly established for over 50 years. Manufacture was, in principle, simple. Firstly nitrocellulose, either in the form of cotton linters or sometimes purified wood cellulose, was steeped in a mixture of sulphuric and nitric acids and thereby converted to nitrocellulose, which possessed the property of dissolving in a mixture of camphor and alcohol, after being thoroughly freed from traces of adhering acid by treatment with boiling water, cold water, and subsequently alcohol.

Cellulose Acetate

Cellulose acetate was first prepared in 1865, but until the war its development as a plastic was not great. During the war the property possessed by cellulose acetate solutions (in common with nitrocellulose solutions) of contracting on drying was used to good effect to produce tautness in aeroplane wings. Cotton linters, acetic anhydride, acetic acid itself and a small quantity of sulphuric acid are kneaded together under carefully controlled temperature conditions. The primary products of this chemical reaction was a form of cellulose acetate which was given certain chemical treatment to improve its solubility. The acetate was then precipitated by diluting the mass with water and was dried and ground.

Returning to nitrocellulose Mr. Sproxton said the transformation of this product and of ground cellulose acetate into plastic material was carried out in a plant of the same type, although the actual ingredients differed. To gelatinise nitrocellulose it was only necessary to place the de-hydrated material in a kneader with the correct charge of camphor and mix the two together with very little heating, after half an hour the product was a pale yellow transparent dough. Cellulose acetate, on the other hand, was kneaded in similar machines with acetone and mixtures of various plasticisers chosen from triphenyl phosphate, tricresyl phosphate, triacetin, various sulphonamides and other stable high boiling organic compounds. The dough might be coloured with soluble dyes producing transparent products. After kneading the batch is filtered under very high pressure to remove accidental dirt. The filtered material is hardened by rolling on heated steel rolls and is then sheeted out on larger slower rollers called calenders, the sheets being finally trimmed into shape for making into a rectangular block.

Manufacture of Casein

In the process of manufacture of casein, the milk was warmed to a temperature of about 27° C. and passed to a separator where the cream was taken off. The skim-milk was conveyed by pipes to large vats and was heated to a temperature of from 30° to 37° C. and concentrated essence of rennet was added. In a short time the curd began to form. The temperature was increased and the contents of the vat were stirred in order to break up the curd into small pieces. The stirring was stopped, the curd allowed to settle and the whey drained off. The curd was then washed with cold water and finally with several changes of hot water. It was filtered in a filter press and the cake was broken up and dried on trays at a temperature not exceeding 45° C.; three thousand litres of milk yielded about 90 kilograms of casein (about 3 per cent.). In the plastics factory the rennet casein is ground to a powder which will pass a 40 mesh screen and is passed over a magnetic screen to remove particles of iron. A weighed charge of powdered casein was mixed with the requisite quantity of water and colours, and plastification was carried out in a screw extruding machine similar to that used for celluloid rods or tubes. The material issued from the nozzle in the form of soft rods which were hardened by being soaked in a dilute solution of formaldehyde.

Cellulose acetate plastics could be heated to 160° C. without decomposition, and at that temperature they flowed readily. They were therefore admirably adapted to the manufacture of moulding powders, especially for ejection moulding which gives a very high rate of output. A thermoplastic, such as celluloid, could be softened by heat and toughened by cold repeatedly without undergoing any permanent change. This was useful as it permitted moulding processes at several stages of the manufacture if required; also scrap kept clean had a market value for re-working into celluloid again.

The Ceramic Society

Spring Meeting at Stourbridge

THE Ceramic Society opened its spring meeting at Stourbridge on May 4, eighty members being present. They were entertained to luncheon at the Talbot Hotel, Stourbridge, by Lieut.-Colonel C. W. Thomas, ex-president of the Society. A paper on "The permeability to air and to water of heavy clay products," was read by Mr. F. H. Clews and Mr. A. T. Green. There was also a symposium on "The winning and transport of the raw materials used in the clay industries," and a lecture on the constitution of coal.

At the luncheon at Stourbridge, Mr. H. Halliday, in submitting "The Ceramic Society," said it was a great personal satisfaction that Mr. Gwynne Vevers, of Bristol, had been elected president. Mr. Vevers was among the first he met when he became connected with the clay industry in 1917 or 1918.

Mr. Vevers, in reply, impressed those engaged on the heavy clay side of the ceramic industry that it was essential that the scientist should come into their midst. They had been very lucky in the past in having the scientist really dealing with his branch of the industry, and it was time they awoke to the fact that if the heavy clay industries were to progress they must have the scientist behind them. He was afraid the members of the heavy clay industry as a whole were very parochial; they looked round their own yard and thought all was well, but he was afraid it was not at the present time.

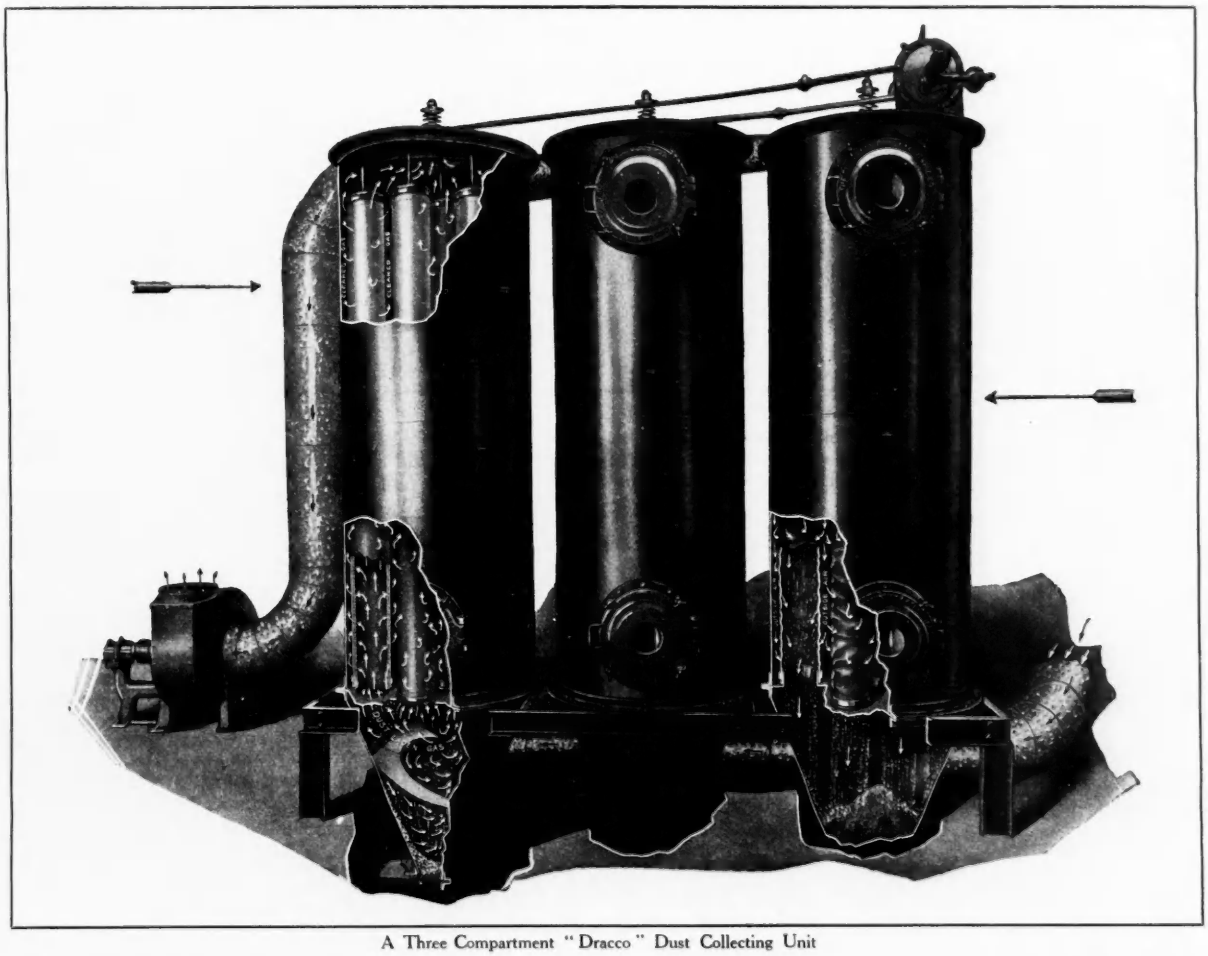
Lt.-Col. C. W. Thomas, replying to the toast of his health, said he recalled the time when Dr. Mellor looked forward to the time when the membership of the British Ceramic Society would reach 1,000, but that figure had now been exceeded.

Dust Recovery and Fume Elimination

A High Efficiency Fabric Filter System

APART from the demands imposed in many directions by legislation, the removal of dust and fume from industrial processes generally has economic justification by reason of (a) improved efficiency of operatives due to healthier working conditions; (b) reduced maintenance expended on machinery and buildings; (c) direct return in the value of reclaimed product; and (d) elimination of fire and explosion hazard. In addition, in the case of dust removal from industrial gases, advantages are established in respect of longer life and reduced maintenance of compressors or gas engines, etc.; and increased efficiency of heat transfer due to absence of dust deposit.

The " Dracco " system of high efficiency fabric filters is claimed to possess outstanding and exclusive features, and has been in extensive vogue in both America and Europe, including some important installations in service in this country. Originally introduced by the Dust Recovery and Conveying Co., of Cleveland, Ohio, the system has been exploited in Great Britain by the Power Gas Corporation, Ltd. In principle it embodies a pneumatic bag shaking mechanism and pneumatic isolating valve, both functioning automatically, and an arrangement for effecting a reverse flow through the filter fabric.



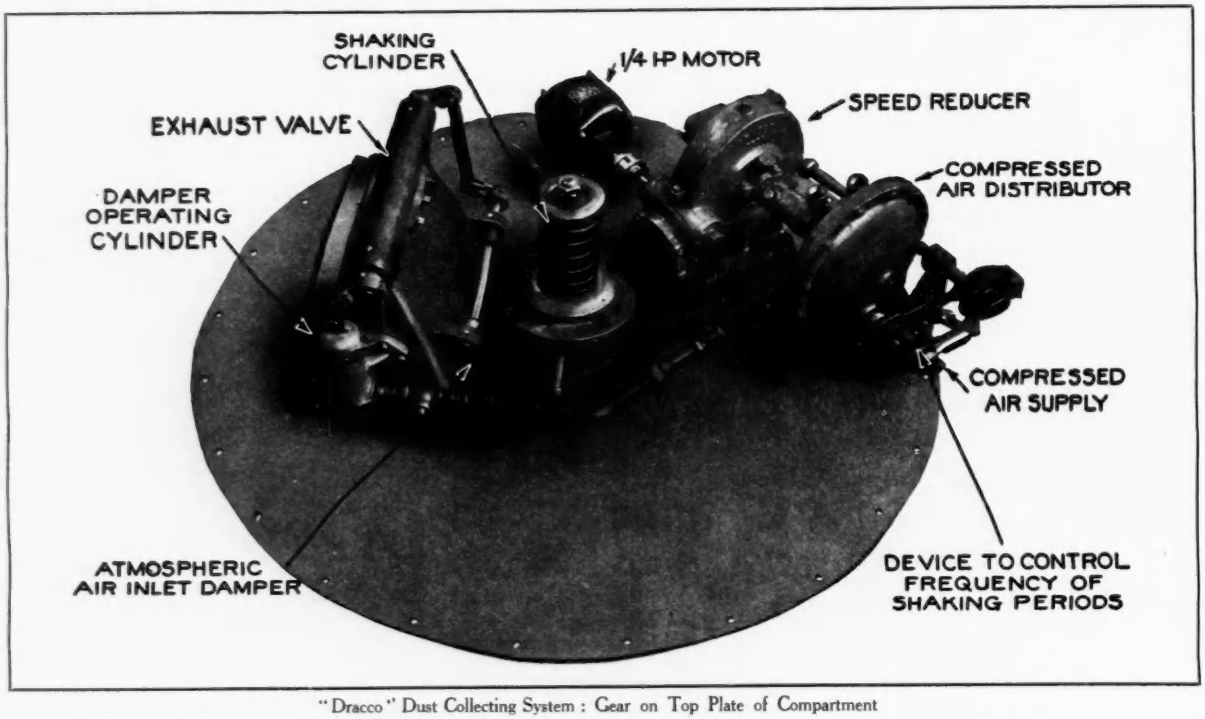
A Three Compartment " Dracco " Dust Collecting Unit

The " Dracco " plant unit, of which typical assemblies and details are shown in the accompanying illustrations, normally comprises two to twelve compartments, depending upon the volume and nature of the air or gas to be handled; larger installations consist of multiple units on the same basis. Each compartment consists of a mild steel casing, dust hopper, top plate, cleaning mechanism and filter bags. Each unit is fitted with gas or air inlet and outlet manifolds, and timing mechanism incorporated with the top plate of one unit. The filter outlet manifold requires to be coupled up to the filter exhaust fan and the discharge is disposed of as desired. When the exhauster is started, the dust-laden air is drawn first into the filter hoppers, where the coarser particles are precipitated at once, but all the fine dust is carried up with the gas or air into the filter bags. As this air or gas passes through the filter fabric, the entrained solids are deposited in a uniform layer on the insides of the bags and the cleaned air or gas is drawn out through the exhaust manifold and fan and, in the case of an industrial gas, passed on to the necessary process, or otherwise to atmosphere.

To prevent an undue pressure loss through the plant, the filter bags are automatically cleaned at regular intervals, which may be instantly varied to suit the dust burden handled. All the filter bags in each compartment are hung from a framework attached to the piston rod of the shaking piston. The main distributing valve supplies compressed air to each filter compartment in rotation, and the air pressure closes a damper which cuts this compartment off the line, and at the same time actuates the shaking piston, the vigorous agitation of which loosens the dust on the inside of the filter bags. During bag shaking, a small amount of atmospheric air is admitted at the top plate causing an air flow through the filter bags in the reverse direction. This air carries down

into the hopper the dust which has been shaken loose from the filter cloth.

The operation lasts from two to four seconds and is illustrated graphically in the right-hand compartment shown in the cylinders, is a matter of about five to ten minutes per shift of eight hours, but periodic examination of the bags is recommended. A compartment can be isolated and the bags therein completely replaced in about fifteen minutes, without the



"Dracco" Dust Collecting System : Gear on Top Plate of Compartment

installation illustrated. For industrial gases where ingress of air would not be permissible or for pressure operation, the reverse flow feature and the disposal of the exit gases are suitably modified.

The average life of the filter bags is from one to five years, depending upon the condition of the gas or air to be treated.

The Internal Supporting Arrangement for Bag Filters

The routine attention required by the filters is negligible. A central lubricator placed in the main compressed air line takes care of the lubrication of all the shaking and air cylinders in the unit. The complete lubrication of a 12-compartment unit and an inspection of the working of the shaking necessity for stopping the process. The power equivalent of the compressed air supply for actuating the shaking mechanism is about $\frac{1}{4}$-h.p. to $\frac{1}{2}$ h.p. per 1,000 cubic feet of gas or air per minute. Where it is necessary to install an exhaust fan to cope with the actual resistance thrown by the filter units, the approximate power requirement (to overcome the filter resistance only) is about $1\frac{1}{2}$-h.p. per 1,000 cu. ft. per minute.

The special advantages of the established "Dracco" filter equipment are simplicity of operation; efficiency of pneumatic shaking mechanism, thus permitting comparatively high filtering rates; high filtering efficiency depending upon the dust burden and average particle size in the incoming gases, etc., but invariably of the order of 99 per cent.; the adoption of small compartments ensures that during shaking periods only a small fraction of the total filter area is isolated, thus causing only negligible variations in the line pressure; and accessibility, each compartment being isolated individually without interferring with or interrupting the operation of the installation.

Manufacture of Chlorinated Phenols

WHEREAS phenol is almost quantitatively transformed into trichlorphenol under certain conditions, according to Iwanowski and Turske ("Przemysl Chemiczny," October, 1932) the chlorination of cresol leads to formation of resinous mixtures from which crystalline trichlorcresol can only be isolated by steam distillation in the low yield of 20 per cent. Pure trichlorphenol melts at 62.5° C. and pure trichlorcresol at 67° to 68° C. The sodium salt of trichlorphenol, which is an excellent impregnating agent for wood preservation, is produced by melting the chlor-derivative under water at 70° C. and cautiously adding sodium carbonate in 20 per cent. excess of the theoretical amount. After moderating the initial violent reaction by dilution, it is continued with the addition of sodium hydroxide. The less highly chlorinated phenols exhibit weaker bactericidal action. The aniline salt of trichlorphenol is said to enhance the germicidal power of cracked mineral oils to a very considerable extent.

The Natural Steam Springs of Tuscany

Their Industrial Exploitation

A PAPER of unusual interest was delivered before the Royal Society of Arts, on May 3, by Senatore Prince Ginori Conti, who dealt with the development of the natural steam springs in Tuscany, and described the industry as it exists to-day.

THE Tuscan fumaroles or steam springs have long engaged the attention of scientific observers, though they are comparatively very little known to the general public. This, said Senatore Prince Ginori Conti, is a fact to be regretted, perhaps, as the industry which was founded on these phenomena, in the course of the last century, which has been widely reorganised and extended during the past 30 years, is undoubtedly the first instance of the industrial exploitation of volcanic forces. Volcanic manifestations, similar in character to those of Tuscany, are to be found in Northern and Southern America, in New Zealand, Japan, Java and elsewhere; in none of these places, however, have they been regularly exploited, though one or two sporadic attempts were made a few years ago. In Tuscany, on the other hand, chemical products are extracted from the steam of the fumaroles; the gases which accompany its emission have been partly and will soon be completely separated for industrial purposes; whilst the thermal energy of the steam is transformed into mechanical and electric power.

The fumaroles are better known by the local name of "soffioni," from the Italian word "soffiore," which means "to blow," on account of the characteristically hissing sound which accompanies the emission of the volcanic steam. In their natural and original state, only a few of the springs were in the form of steam vents, these latter being, in fact, rather the exception than the rule and occurring only when local conditions were suitable. In the greater number of instances the steam, by forcing its way through crevices and owing to the chemical agents it contains, corroded the soil around the orifice from which it burst forth. In consequence, a cavity, in which water accumulated, came to be formed. This was due partly to steam condensation, partly to rain water, so that a pool of more or less considerable size was the result: the steam and its accompanying gases, forcing their way through the water, made it boil in many cases so furiously as to raise immense bubbles which gave the impression that the pool was going to boil over. These were the famous "lagoni" of Tuscany, which were known centuries ago and used to be looked upon with terror by the rare inhabitants of that almost deserted and wild district as manifestations of infernal agencies.

Origin of the Industry

As a consequence of the discovery made in 1777 by the German chemist, H. Höfer (who had proved that boric acid was contained in the water of one of the lagoni), the manufacture of borax was then attempted by combining boric acid with soda. The extraction of boric acid, however, was not begun regularly until 1818, by François de Larderel, hence the name of Larderello given in 1847 to the first of his works. The boric industry from that time has been continued without a break in Tuscany; it was exceptionally prosperous during a considerable period, especially during the first 50 years, when Tuscan boric acid was practically without competitors in the world's markets. In 1827 François de Larderel had the brilliant idea of using the natural steam as a heating agent for concentrating boric solutions and this ingenious device was decisive for the future of the Tuscan boric industry, as he was thus enabled to dispense with wood fuel, the expense of which heavily handicapped him. This was undeniably a great achievement; indeed, it was the first step towards making use of the thermal energy of the volcanic steam springs, but almost a century was to elapse, however, before anything further was done in that direction.

Another most important feature which was subsequently introduced was that of drilling bore holes in order to obtain boric waters and steam. Had this not been carried out, it is doubtful if the industry would have achieved the brilliant results which raised it to the prosperity it long enjoyed. The first attempts at drilling the volcanic rock around the fumaroles date back probably as far as 1832 but it was not till some years later, about 1837, that this practice became current at the various boracic works which had been erected in the immediate neighbourhood of the fumaroles. These works exist to this day; they are eight in number, all of them belonging to the same company, which has been the outcome of the amalgamation of the older firm of Larderel with other minor firms. The borax works, the refineries and the various other departments of our industry are all at the Larderello works, while the other seven works produce only crude acid which is conveyed, for refining and milling processes, to Larderello, where raw acid is also produced.

Early Methods for Extracting the Borax

When, in 1904, Prince Ginori Conti was entrusted by his father-in-law, Count Florestano de Larderel, the grandson of the founder, François de Larderel, with the general management of his works, the Tuscan boracic industry was passing through a difficult period, owing to the serious crisis due to the formidable competition of borax derived from the recently exploited American fields. The methods followed for the extraction of boric acid were extremely simple, as they consisted mainly in the concentration of the boric waters of the lagoni or of the waters extracted from the sub-soil surrounding the fumaroles, which is more or less charged with boric acid, the result of the passage of volcanic steam through it during centuries. Concentration was effected by making these waters flow over evaporating pans which were heated by volcanic steam, circulating in a flue beneath. The concentrated solution thus obtained was subsequently poured off into tanks in which the acid crystallised on cooling. Crude boric acid was the result and for many years this was the only product of the works. No attempt was made to refine the acid nor to manufacture borax, though this last chemical had been the initial aim of the first pioneers who had started working the Tuscan lagoni as far back as 1810.

Understanding the crying need of improvement, Count Florestano de Larderel began by erecting at Larderello borax manufacturing plant (1884) and subsequently a refining plant for boric acid (1890); this was only a first step, however, and far more was necessary in order to cope with the growing competition which threatened the future of the time-honoured Tuscan industry, that had supplied boric acid to practically the whole of Europe and America during almost half a century.

Utilisation of Thermal Energy

At the outset Prince Ginori Conti directed his efforts towards improving existing methods. Ever since his first visits to Larderello, he had been struck by the fact that precious thermal energy was being wasted and visions of the great possibilities which its utilisation might offer presented themselves to his mind. Were the considerable amounts of steam which the soffioni poured forth to be used always in so incomplete a fashion? Was it not feasible to turn them to far more important applications by using them in engines or turbines? These were the chief questions which haunted him.

First of all, it was essential to have trustworthy data as to the composition, pressure and tempeprature of the soffioni steam. This was done under the direction of the late Professor Nasini. One important fact established was that the soffioni steam is superheated. Professor Nasini had long been interested in Larderello, on account of the research work he was carrying out on Italian thermal springs, with reference to the presence of argon and helium. His work at Larderello was encouraged by the late Dr. Ludwig Mond and that the results were notably satisfactory, as Professor Nasini and his assistants were able to prove that the gases which are present in the soffioni steam are comparatively rich in helium. At the same time efforts were also devoted to the improvement of the chemical plant for the manufacture of boric acid, borax and the recovery of ammonia, first by fixing it as ammonium sulphate and later as ammonium carbonate.

The improvements which opened up new and important possibilities, were not, in the first instance, obtained at Larderello but at two other boracic works, first at Serrazzano and then at Castelnuovo, where two wells higher pressured were measured, at maximum output, than the former average of 14 lb. per sq. in. This fact led us to consider the advisability of experimenting whether the direct use of natural steam in a turbine might not be possible, of course, dispensing with the use of a condenser. This was tried and the ultimate result was the erection of two power plants which differ from the original plant at Larderello by the fact that the turbines are of the free exhaust type, as the use of a condenser would be quite out of the question for the reason that they are fed with steam of the soffioni and its accompanying gases. Meanwhile, the improvements in drilling apparatus and in well casing had given encouraging results also at Larderello, where wells of about 132,000 lb. output an hour, at an average pressure of 2.5 atmospheres, had been drilled.

The total power realised at the four various works now averages 14,400 kW. In the electric equipment there is a somewhat wider use of aluminium in the place of bare copper, wherever the substitution is feasible, on account of the corrosive action of sulphur dioxide on copper. Three-phase current is generated at 4,500 volts, 50 periods frequency and transformed up to 16,000 and 40,000 volts for transmission lines. The total output of steam from all the wells at the various works can be estimated now at over 2,000,000 lb. per hour, but as only a portion of this is utilised for feeding the power plants, which are yielding continuously about 12,000 kW, there are important quantities of steam which the Tuscan geothermic plants could yet utilise.

Boric acid occupies, even by right of seniority, the place of honour among the products of the chemical department. The abolition of the old lagoni, doing away with the impurities which formerly polluted the first concentrations of the boric liquors, enables acid at a high grade of purity to be obtained, namely, about 90 per cent., while previously the crude acid barely arrived at 84 per cent. The crude acid now placed on the market is of 95 per cent. grade. Considerable improvements have also been introduced in the refining plants which allow the mass production of pure acid up to B.P. standard. Borax is manufactured at Larderello, using boric acid and sodium carbonate and the old plant has been recently brought thoroughly up to date, in order to meet all requirements. Special boric products, such as calcium borate, magnesium borate and sodium perborate, are also manufactured as well as various toilet specialities, namely, boric talcum, boric and borax soaps.

Another product contained in the volcanic steam, is ammonia. It was barely 28 years ago that the first attempts were made with the purpose of utilising the ammonia contained in the very impure salts which were then the result of the last boric mother liquors, by making from them sulphate and carbonate of ammonia. Repeated experiments for the separation of ammonia from the soffioni steam before its further utilisation, have led now to extremely simple and efficient devices which make this feasible.

Utilisation of Gaseous Constituents

About 92 per cent. of the gaseous mixture is carbon dioxide, although the proportion of gas to steam is about 6 per cent. by weight, at Larderello, so that, reckoning on the total hourly output of steam at these works, it is clear that enormous volumes of carbon dioxide are available. Other components of the gaseous mixture are sulphur dioxide, methane, hydrogen, oxygen, nitrogen and small proportions of rare gases, namely, argon and helium. The industrial utilisation of these gases has been studied and much laboratory work has preceded its practical realisation. The first step has been the separation of carbon dioxide and a large plant has been erected for that purpose at Larderello, where it has been running now for some years. The gas is first entirely freed from sulphur dioxide and subsequently compressed. Sulphur dioxide, which is the most disturbing of the impurities, will ultimately be turned to account, after its complete separation from the latter, for the production of hyposulphites and sulphites. The separation of hydrogen, nitrogen and the rare gases will be effected by meaus of apparatus which is in course of erection. Of the rare gases, helium (which has already been separated experimentally) is the one which more especially claims attention, not only on account of its characteristic properties but also because it is contained in proportions which, though slight, make it worth while separating on a semi-industrial scale. The radium emanation, which has been accurately estimated, is still under laboratory observation.

Chemistry and Engineering

Recent Advances by Co-operation

At the Institution of Civil Engineers, on May 2, the thirty-ninth James Forrest Lecture on "Recent Advances in the Application of Chemistry to Engineering," was given by Sir Harold B. Hartley. Sir Murdoch Macdonald, M.P., president of the Institution, was in the chair.

Sir Harold Hartley stated that chemistry was the main source of power in engineering. In these days when chemistry had passed through its elementary stages and had become an all-important science, the engineer and the chemist were in constant partnership.

Chemists, having revealed the structure of alloys, and having widened their interests in this respect, had discovered new metals, and had thus established a link with engineers. The discovery of rare gases had further united the chemist and the engineer. Helium, being a non-inflammable gas, was an essential factor in airship construction. Neon was used in traffic signals, and argon was found to be the most suitable gas for filament lamps. The internal combustion engine had long been the subject of special study by the engineer. It was found that the efficiency of combustion engines depended on the fuel used. In order to find the requisite type of oil, the chemist had been called in, and as a result of his researches, the internal combustion engine had reached the efficiency that could propel an aeroplane at more than 340 miles an hour. In lubricating oils, the chief factor in promoting efficiency was the ability to resist oxidation, and accordingly the chemist had extracted the hydrocarbons, and had produced pure lubricating oil.

Rubber had played an important part in the linking together of the chemist and the engineer. The curing of rubber and its combination with certain minerals, had produced a rubber with an altogether tougher resistance than had been produced before. Thus rubber had found its way into the motor industry, and, by the production of hard ebonite, into many branches of engineering. Plastics was another chemical compound affecting engineering. The discovery of synthetic resins had enabled plastics to become non-inflammable, had promoted hardness and mechanical strength, and when moulded under copper, had given it a highly polished surface. Plastics were therefore used in the electric and motor industries, for silent gears, differentials, and magnetos.

Sir Harold spoke of many other spheres where chemistry was applied to engineering. He referred to the examination of coal with relation to its use in furnaces, to the value of plastics as insulating material, to copper as used in transmission cables, and to the activities of the chemist in gasworks. Further examples were the development of cement and artificial stone, and non-tarnishing fittings for building purposes, the treatment of plaster so that painting could be carried out immediately, and the construction of fire extinguishers in the form of carbon-dioxide gas. Concluding, Sir Harold said this was an age of border-line sciences. Mathematics, chemistry, and engineering, were all linked together, and whenever the chemist and engineer had combined, they had been successful.

Sir Robert Hadfield proposed a vote of thanks to Sir Harold Hartley. Sir Archibald Denning seconded, and said that Sir Harold had covered all branches of engineering in his lecture.

Quenching and Tempering in Alloys

Twenty-Third May Lecture of the Institute of Metals

THE study of thermal treatment is often of more practical importance than the search for new alloys, said Professor Albert Portevin, in the course of the 23rd May Lecture of the Institute of Metals, given on May 10. For a long time steel was the only metallurgical product to which quenching and tempering were industrially applied; later, other alloys, such as "aluminium-bronze," appeared to present analogous phenomena which were susceptible of practical use, and quite naturally one sought to connect their mechanism and their laws with those of steel, for so greatly does the scientific spirit desire to form generalisations. Towards 1911, Wilm discovered, in alloys formed by the addition of magnesium to commercial aluminium, the phenomena of spontaneous hardening after quenching. This appeared astonishing, and its mechanism was discovered only several years later, as a result of researches, in particular those of Rosenhain and his collaborators. These light alloys containing magnesium were at first regarded as an exception, but later on similar results were obtained simultaneously in America and in France with other light alloys containing copper and without magnesium.

In brief, the study of quenching and tempering phenomena has for its objective to find, to put forward, to define, and to measure, all the modifications accompanying these thermal treatments, certain inner modifications appearing as the cause, the origin, or the explanation of other modifications which are more visible, more utilisable, and which will be considered as effects and consequence of these phenomena. One can say that there has been an effect caused by thermal treatment if the thermal cycle leads to any modification of one of the properties or one of the characteristics considered, but it is important to distinguish carefully between two large classes of modifications. In the first place specific or local modification affect the constitution, the structure, and the properties of the part of the metallic mass under consideration as a function of the thermal cycle described by this part independently of the rest of the piece. Secondly, general modifications affect the properties or the characteristics of the whole piece, such as its shape, its dimensions, its internal stresses, and consequently its general mechanical properties, and which are functions of the divergences existing between the thermal cycles undergone by different parts in the piece.

Variations of Properties

All variations of properties can be classified under the headings of (*a*) physico-chemical modifications (nature and proportions of the constituents); (*b*) structural modifications (shape, fineness, distribution, work, hardness of the structural elements); and (*c*) modification of the elastic internal stresses. To each classification there corresponds an equilibrium state, being (*a*) physico-chemical equilibrium defined by the equilibrium diagram; (*b*) structural equilibrium which would be realised by the complete separation of the phases, each forming only one single crystalline individual; and (*c*) elastic equilibrium where there is complete absence of internal stress. Practically, it is possible to attain only the states of physico-chemical and elastic equilibria; the state of structural equilibrium remains an ideal. The non-equilibrium states are the quenched states, and all treatment which leads to a departure from the equilibrium state produces a quenching effect; inversely, all treatment tending to bring back towards the equilibrium state corresponds with a tempering effect. Thus there are physico-chemical, structural, and general quenches and temperings. Up to the present, however, the hypotheses and theories of quenching have not brought about any revolution, and have not led metallurgists to discover any new fact or to foresee any phenomenon.

Considerable progress has been effected in the last twenty years in experimental technique and in the apparatus used, so that the methods of thermal analysis have been greatly improved and other methods have been introduced or have been standardised, such, for example, as dilatometric analysis and thermo-magnetic analysis. Finally, the study of crystalline structure has benefited by X-ray spectroscopy. In spite of that, the study of the quenched states, *i.e.*, of non-equilibrium conditions, remains incomparably more complex than that of equilibrium conditions, for the modifications that they undergo or that bring them into existence are transitory and often rapid, being irreversible and unstable.

In order to obtain quenching effects on cooling a material which has been heated to a temperature θ, it is obviously necessary that the chemical equilibrium constitution which exists at θ must be different from the chemical constitution at ordinary temperatures; for, were they identical, no modification would take place during cooling, however rapid it were. Theoretically, there is always the possibility of quenching except in the case where, during the whole thermal cycle, the metal remains in a single-phase field of the equilibrium diagram. An appreciable quenching effect, however, has never yet been observed except in two principal conditions; these are where heating to a temperature θ is accompanied by (*a*) sufficient variation of the concentration x of at least one phase in a mixture; and (*b*) change of the nature of at least one phase, *i.e.*, the appearance of a new phase. Restricting ourselves, for the sake of simplicity, to binary alloys, one can say that almost all cases of quenching may be connected with the increase on rise of temperature of the concentration of a phase α in a mixture $\alpha + \beta$ (in other words, increase of solubility in the solid solution α of a phase β which is frequently a chemical compound), and the transition on heating of a mixture of two phases $\alpha + \beta$ into a single phase γ. Quenching does not in general produce an important hardening, and consequently a marked increase of strength. This result is obtained by the precipitation of the compound β from the supersaturated solution during the return to an equilibrium state, *i.e.*, by tempering effect, from whence comes the name "structural hardening" or "precipitation hardening."

With rise of temperature there is simultaneously (*a*) the possibility of a tempering effect on heating to a high temperature if the initial state is not an equilibrium one (this may be a physico-chemical tempering or precipitation starting from a supersaturated solution accompanied by hardening and structural tempering, or coalescence with softening), and (*b*) the possibility of a quenching effect by the precipitate going into solid solution with preservation at ordinary temperature of a greater concentration than this solid solution. Depending on the initial state, the temperature reached, and the speed of heating and cooling, a tempering or quenching effect can predominate in the final result, which may further be considered to be different according to whether it is determined by a physical property (such as dilatation) which is mainly a function of the physico-chemical state, or by a mechanical property (such as hardness) which is a function of this state and of the structural state.

Commonness of Structural Quenching

The phenomena of quenching with structural hardening or precipitation hardening, starting from a supersaturated solid solution, are extremely numerous. To show the commonness of the effects of structural quenching, it will suffice to recall the effects of hardening by precipitation observed for aluminium containing Si, Be, Cu, Mg_2Si, Ag, and Zn; for silver containing Cu, Cd, Cu_2Cd, Si, Cu_3Si, Cu_2Mg, Cu_2Sb, $MgZn_2$; for copper containing Ag, Be, Cr, Co, Fe, Pd, Pt, Si, Be_2Si, Co_2Si, Cr_2Si, Mn_2Si, Ni_2Si, Ni_3P, Ti, Zn; for gold containing Cu, Fe, Ni, Ni_2Si, Co_2Si, Cr_2Si, Pd, Zn; for iron (ferrite or austenite) containing B, Be, C. Ce, Cu, Mo, Nb, N, O, Ta, Ti, U, W, Zr; for cobalt and nickel containing B, Be, Si, Ti; for lead containing Bi, Ca, Sb, Sn; for palladium and platinum containing Au, Ag, or Cu; for tin containing Pb; for zinc containing Al, Cd, etc. It is of particular interest that the result depends on the difference between solid solubility at high and low temperatures, and not on the mean solubility, *i.e.*, the total amount of the element—metal or definite compound—which is added, and that consequently it can be obtained with very small additions (thus for iron 0.5 per cent. nitrogen or 0.04 per cent. carbon, for copper 0.08 per cent. chromium, for aluminium 0.01 per cent. beryllium, etc., is sufficient), and that the increase of strength observed can be enormous with small additions. It has been possible in this way to triple or even quadruple the resistance

in the cold of certain ductile and soft metals, such as copper, and the alloys of precious metals.

Further, the accelerating effect of deformation on precipitation explains the phenomena of mechanical and magnetic ageing of steels. Since all the constituents have theoretically a solubility which varies with temperature, all impurities and elements present in steel (carbon, nitrogen, phosphorus, oxygen, etc.), can, in principle, be the origin or cause of ageing; for the same reason, industrial metals never being perfectly pure, ageing phenomena must be quite general, and not limited to iron and ferrous materials. It may also be noted that the hardening element is very often a definite compound (or an intermediate phase of the diagram) formed, either by the addition of a new metal or element to the basis metal (example $CuAl_2$ in aluminium and in copper; Fe_3W_2 in iron) or by two other elements, as Mg_2Si in aluminium and Ni_2Si in copper. From this arises the interest in those alloys formed by a metal with a definite compound which can be found in considering, internary diagrams, the pseudo-binary sections passing through a corner of the composition triangle. These definite compounds may be nitrides, oxides, sulphides, phosphides, etc.

Crystallisation and Precipitation

To make use of these phenomena in order to obtain an alloy which has a high strength at high temperatures it is necessary (*a*) that the precipitate or segregate shall be a constituent which is very rigid when hot, in order to play its part as a pin fixing the slip planes; and (*b*) that the thermal zone of precipitation should be as elevated as possible, and in any case should be higher than the temperature at which the material is to be used. As this zone is related to the zone of recrystallisation after work, and consequently to the thermal zone where viscosity becomes perceptible, one takes as a basic constituent a stable solid solution which presents these characteristics, and as a consequence contains a sufficient concentration of a refractory metal and a suitable basic metal. Thus, starting from iron as a basic metal, one will make use of austenitic solid solutions by adding nickel, for example, preferably to ferrite solid solutions which recrystallise more easily, and to unstable martensitic solid solutions one will add refractory metals and elements capable of giving resistant precipitates at high temperatures. As an application of these laws, consider the nickel-tungsten-, the nickel-molybdenum-, and the nickel-chromium-tungsten-austenites the zones of hardening of which are situated between 650° and 950° C. and the precipitates of which are tungstides, molybdides, and carbides. Observe equally in this case the accelerating effect on precipitation of deformations, either in the cold (preliminary work) or at high temperatures (forging).

Crystallisation and precipitation in a liquid phase, where the shape and the orientation of the crystals and particles are governed principally by the structure and the property of a segregate (crystalline lattices and faces, speeds of crystallisation, and surface tensions), give birth to idiomorphic forms; the form and the orientation of the precipitated segregations in the crystalline region are strongly influenced by this medium, *i.e.*, by its orientation and it crystalline structure. From this there result pseudomorphic or metamorphic forms which depend hereditarily on the structure of the initial medium, *i.e.*, on the solid solution matrix. In the cases of progressive precipitation or segregation of a constituent in a solid solution of uniform concentration and justaposed grains their are two principal modes of distribution (*a*) in the grains, (*b*) between the grains.

Two Types of Segregates

In the grains the directive action of the crystalline medium on the precipitated phase or segregates is manifest in very different degrees, so that one observes in particular two types of precipitation or segregate. For the first type there is separation in lamellæ or needles, crystallographically oriented in relation to the generating medium. The best-known example is that of the Widmanstätten structure observed in steels (separation of ferrite and pro-eutectoid cementite from the solid solution) and in the ferro-nickels of meteorites. We may also quote the needles in the α solid solution of brasses and "aluminium-bronzes." The crystal lattice to which the precipitate belongs does not appear to have any influence on its exterior shape, because this latter is the same for different precipitates separating from the same phase, and these precipitates orient themselves according to planes parallel to the cube, octahedron, or dodecahedron faces in a cubic structure. For the second type there are fine and regular precipitates scattered in the grains separating relatively slowly compared to the preceding ones. These are the ones which are observed in the numerous cases of "structural hardening" or of "precipitation hardening" which have just been mentioned. These two types of precipitates appear to depend primarily on the relative values of the speed of spontaneous precipitation and the speed of growth of the precipitate (which are values related to the spontaneous power of crystallisation and the speed of linear crystallisation when the crystallisation takes place in a liquid medium). A predominance of the speed growth would correspond with the first type of precipitate, and conversely.

The segregate which separates is distributed in the junctions of the grains in the solvent. Such junctions give rise to the cellular structure in which one constituent forms the material mesh of a net, a mesh containing the other constituent. Without going so far as to form a continuous network, the boundaries or joints of the grains exert an action on the distribution, the orientation, and the proportion of the segregate; hence we have precipitations distributed in a network at the junctions of the grains, which are the origin of intercrystalline corrosion, of which a striking example is furnished by the non-oxydisable austenitic steels of the type containing 18 per cent. of nickel and 8 per cent. of chromium, when, after quenching, they are given an annealing at about 650° C., which gives rise to a fine precipitation of a complex cementite in the grain boundaries. From this influence of the boundaries we may deduce the influence of the fineness of the grains in the solid solution, precipitation being aided when the grains are fine. This partly explains the effects of structural overheating on one hand, and of forging on the other.

Society of Public Analysts

Water-Extractable Chromium in Leather

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on May 3, the president, Mr. F. W. F. Arnaud, in the chair. Certificates were read in favour of Lionel H. James, M.Sc., A.I.C., and Arthur Jones, M.Sc. The following were elected members of the Society:—George V. Hall, M.Sc., A.I.C., Geoffrey Holland, B.Sc., A.I.C., Herbert S. Howes, B.Sc., F.I.C., Frederick W. M. Jaffé, B.Sc., A.I.C., and M. M. Love, F.I.C.

The examination of leather for the presence of extractable chromium compounds, was the subject of a paper by F. E. Humphreys and H. Phillips. In view of the fact that cases of dermatitis have been attributed to the wearing of chrome-tanned leather, experiments were made to ascertain the amounts of chromium compounds which can be extracted from various types of chrome leather, under conditions similar to those which the leather encounters during wear. The results showed that chrome leathers suspected of causing dermatitis did not contain a greater quantity of water-extractable chromium than did normal leather, and it is suggested that, whilst none of these leathers would irritate the skin of an average person, many chrome leathers might irritate the skin of a person particularly sensitive to the action of chromium compounds. Analogous experiments proved that solutions resembling sweat in composition do not remove much more chromium, either in the form of chromate or trivalent chromium compound, although slightly acid solutions tend to extract slightly larger amounts than neutral solutions.

Examination of Butter Fats

The phytosteryl acetate test as a routine method for examining butter fats, was dealt with by Herbert Hawley. The method described was one in which the sterols are directly extracted from a small amount of butter fat by shaking with chloroform and an alcoholic solution of digitonin, and then converted into acetates the melting point of which is determined. This method will detect 5 per cent. of vegetable fat in butter or ghee. A special form of apparatus has been devised for the extraction.

Development of the Titanium Pigment Industry

Dr. Leslie Burgin Opens New Plant at Luton

DR. E. LESLIE BURGIN, Parliamentary Secretary of the Board of Trade, and member for the South Bedfordshire Division, on Wednesday formally inaugurated the new plant for the manufacture of titanium pigments which has been installed at the works of B. Laporte, Ltd., and National Titanium Pigments, Ltd., at Luton.

The titanium pigments are chiefly used for paint making, sometimes in conjunction with other pigments, and are usually employed combined with precipitated barium sulphate. At Luton the barium sulphate is produced from British barytes. Titanium pigments are also employed for a variety of purposes in the manufacture of inks, soaps, cosmetics, polish, starch, pencils, ceramics, cement, paste, paper and other preparations, and they give particularly white or clear bright colours to rubber goods, plastics and celluloids.

Dr. E. Leslie Burgin, Parliamentary Secretary of the Board of Trade, setting the grinding plant in motion. On his right is Mr. T. Keens, who presided at Wednesday's ceremony

The industry promises to become one of considerable importance. During the last eight years the production in the United States has reached 75,000 tons of pigment per annum, containing 25 per cent. of titanium oxide. This output is still increasing as compared with other pigments. It is claimed for titanium pigments that they have very high whitening or hiding power. This opacity amounts to eight to ten times that of white lead. They are completely non-poisonous in character—a fact which overcomes the risk of lead poisoning. They are unaffected by aqueous acids or acid fumes. In this connection it is emphasised that they are unaffected by sulphuretted hydrogen and that other sulphur compounds have no darkening action upon them. Titanium pigments are unaffected by salts or sea water, or by heat up to red heat, so that they stand stoving well.

Close upon 200 guests, representing many branches of the chemical industry, the financial world and municipal authorities, were received at the works by Alderman T. Keens, a director of the associated companies, in the absence, through illness, of Alderman H. Arnold, chairman of the companies. In the titanium factory, Dr. Burgin operated a switch and started up the grinding mill, representing the first operation in the manufacture of titanium pigments.

The visitors then toured the works in small groups and saw the complete process of manufacture, from the grinding of the ilmenite, through the stages of sulphonation, crystallisation, clarification, hydrolysis, washing, neutralisation, furnacing and grinding to the final standardisation. They also visited the older part of the works, where they saw the production of barium peroxide, hydrogen peroxide and sodium perborate. At the close of the tour they were entertained to luncheon at the George Hotel, Luton, under the chairmanship of Alderman Keens.

DR. LESLIE BURGIN, in proposing th toast of "Success to the New Industry," said the one thing that had struck him was the reflection, "How much greater was man than any machine." They could not think of any new industry without bearing in mind all the work that the pioneers had done. The visitors had been impressed by the spaciousness of the layout, the extreme cleanliness of the premises and the complete absence of any overpowering odour. For some years there had been a titanium pigment plant at Barking, and for the past seven or eight years experiments had been conducted to Luton, and then a pilot plant had been put down.

It was not for him to sing the praises of the products which were to be made in the model factory which they had been privileged to inspect that day, but it was only right that he should refer to the arts and crafts of the men who had laid out the plant, designed the apparatus and produced the results, and upon whose efforts the success of the enterprise would ultimately depend. He referred more particularly to the services which had been so ably rendered by Mr. I. E. Weber on the chemical side, Mr. J. Sutherland on the architectural side, and Mr. L. P. O'Brien on the salesmanship side. There had also been financial genius behind the scheme, and that had been supplied by Mr. Keens. The Government had contributed its share by giving them the benefit of a duty of 10 per cent. upon foreign imports, increased in 1932 to 20 per cent.

Barking Plant Closing Down

MR. T. KEENS, responding to the toast, said that during a period of the most acute depression they had enjoyed continuous development, increased sales and increased profits. He expressed on behalf of the board their sincere thanks to the technical, commercial and clerical staffs for their services in connection with that day's function. With regard to titanium, continuous experiments had been going on, and for some years B. Laporte, Ltd., had been interested, with its associates in Canada, in developing the industry. The company was a substantial shareholder in Titanium, Ltd., Montreal, and the development of processes for the manufacture of titanium oxide and titanium pigments outside Canada was left to the control of B. Laporte, Ltd. During last year the company decided to consolidate its position in the titanium field and acquired a controlling interest in National Titanium Pigments, Ltd., who were operating a pilot plant at Barking.

In view of the volume of imports of titanium pigments and there being no other British manufacturers, the directors decided upon the plant at Luton. The new factory was now completed, manufacturing had been commenced in the past few days and the works at Barking would now be closed.

Mr. Keens then proposed the toast of the guests, which was responded to by Mr. S. Howard Whitbread, Lord-Lieutenant of Bedfordshire, and Lord Leverhulme, president of the Institution of Chemical Engineers. Lord Leverhulme referred in his speech to the business relations between his own firm and B. Laporte, Ltd., in connection with the supply of sodium peroxide.

THE MAYOR OF LUTON (Mr. G. Wistow Walker) proposed the toast of the chairman, to which Mr. Keens briefly replied.

Letter to the Editor

Stainless Steel Balances

SIR,—Your laboratory equipment number was very interesting, but did not tell us what we want to know about balances. When are we going to get a balance made in stainless steel or chromium plated? This would be a boon to those chemists whose balances cannot be kept entirely away from fumes (one author actually advises balances on the working bench). I recommend the idea to our balance manufacturers and would like to see a good strong balance, free from complications about the beam, easily cleaned, all metal parts made in stainless metal, side action and sensitive to 1/10th milligram.

Thanking you for your special number and hoping you will repeat the idea at regular intervals.—Yours faithfully,

J. NICOL,
Chief Chemist.

The Clyde Alloy Steel Co., Ltd.,
Craigneuk Works,
Motherwell.

The Royal Institution

Annual Report

THE annual meeting of the members of the Royal Institution of Great Britain was held on May 1, the president, Lord Eustace Percy, in the chair. The annual report of the Committee of Visitors for the year 1932 gave evidence of a year of steady activity. On the research side the X-ray investigations into the structure of a variety of substances, under the direction of Sir William Bragg, showed steady progress. The treasurer's report indicated that the separate account for the cost of the reconstruction of the Institution would now be wound up on the completion of all payments in connection with the rebuilding.

The following were unanimously elected officers for the ensuing year:—President, the Right Hon. Lord Eustace Percy; treasurer, Sir Robert Robertson; secretary, Major Charles E. S. Phillips. The total membership of the Institution on December 31, 1932, was 969 (honorary members 59, members 867, associate subscribers 43), compared with a total on December 31, 1931, of 974 (honorary members 60, members 887, associate subscribers 27). During the year the Institution has lost by death several distinguished members who had taken an active part in its affairs, including Mr. A. Chaston Chapman, Sir Dugald Clerk, Dr. Ernest Clarke, and Sir Alfred Yarrow; and an honorary member of great distinction, Professor Wilhelm Ostwald.

During the past year all the places in the Davy Faraday Laboratory have been occupied, and work has proceeded steadily and well. The absolute determination of the structure of anthracene by Dr. Robertson has been completed and has furnished interesting and important measurements of the structure of the benzene ring. Dr. Müller's work on the long chain compounds has brought into prominence certain curious features of the changes in crystal structure as the substances are brought close to the melting point; this has interesting connections with the recent conception of the revolving molecule. Dr. Gilchrist has been occupied in the preparation of organic substances for the X-ray workers. An interesting apparatus for the distillation of organic substances in vacuo has been very useful; on one occasion it was employed in a novel manner to furnish the answer to a problem encountered in the petrol industry. Dr. Knaggs has been exploring the structure of an explosive substance, cyanuric triazide. Among independent research workers, Dr. J. MacArthur has been assisting Dr. Müller in the investigation of polymorphism in the series of monobasic fatty acids; Dr. J. Iball, working in conjunction with Dr. Robertson, has under investigation the structures of anthracene derivatives and of chrysene, a substance of a special biological importance; Dr. F. Halle has worked on the dibasic fatty acids, with the object of discovering the configuration of the carboxyl group; Dr. Pohland is examining the tetrachloride, bromide, and iodide of silicon; Miss Pickett has made good progress in a very interesting comparative research on the structure of diphenyl, triphenyl and tetraphenyl; and Mr. C. Cuthbertson is comparing the refractive indices of ortho- and para-hydrogen.

The New I.C.I. Dyestuffs

A New Colour for Hat Leathers

TWO new additions to the range of British dyestuffs for use in the textile industry, as well as a new colour for the leather trades, have been introduced by Imperial Chemical Industries, Ltd. The latter is of special interest for hat lining leathers on account of its superior fastness to rubbing and perspiration. Dispersol Diazo Black BS Paste, on diazotising and developing with beta-Oxy-naphthoic Acid S, gives deep blue-black shades of very good fastness to washing and good fastness to light. It is suitable for the production of black shades on all types of acetate silk materials where the above mentioned properties come into consideration. This new black is similar in general properties to the already established product, Dispersol Diazo Black AS. It possesses, however, two important advantages over the latter product in that it does not mark-off during hot pressing or steaming and the black produced by diazotising and developing shows much less tendency to develop brown tones than is the case with some developing blacks.

Durindone Orange RS paste is very suitable for the direct printing of cotton, viscose and natural silk, giving good results by a potash-Formosul recipe. It produces bright reddish orange shades possessing excellent fastness to chemicals and good fastness to severe washing. It can be used as a ground shade on cotton for the production of white effects by the Formosul-Metabol discharge process. This colour is also suitable for application to all types of cotton materials for the production of bright reddish orange shades of excellent fastness to washing and bleaching. It possesses excellent fastness to kier boiling which makes it of particular interest for the dyeing of yarns, warps, etc., which are to be woven with grey material and subsequently bleached in the piece. Owing to the fact that it is a hot dyeing colour it has excellent penetrating properties. Durindone Orange RS paste, moreover, is applicable to viscose artificial silk and possesses the valuable property of producing even shades on material of irregular quality. It will be of interest for the dyeing of loose wool and slubbing giving shades of excellent fastness to milling and very good fastness to light. Its good fastness to degumming and light also make it of interest for the dyeing of natural silk, whilst by reason of its excellent penetrative properties it is specially suitable for the dyeing of linen.

Acronol Phosphine GS is of particular interest for the dyeing and staining of vegetable tanned leathers; the shades obtained by its use being clear golden yellows. On account of its superior fastness to rubbing and perspiration, this product is of great interest to dyers of hat lining leathers—on which class of material a high degree of fastness to rubbing and perspiration is a prime essential. It is also of interest in the dyeing of chrome tanned leathers, where it is used for topping and brightening shades dyed with direct dyestuffs.

Rubber Industry Research

Text of Lord Irwin's Bill

THE text has been printed of the Rubber Industry Bill, introduced by Lord Irwin in the House of Lords on May 2, which provides for the collection and application of contribution from rubber manufacturers in the United Kingdom to the Research Association of British Rubber Manufacturers.

The contributions are to be paid by every manufacturer in respect of specified descriptions of rubber delivered to him on and after July 1, 1933. In the first instance the rates of contribution will be one twenty-fifth of a penny per lb. for rubber, uncompounded and unvulcanised, not forming part of a completely or partly manufactured article, and not containing less than 20 per cent. by weight of unvulcanised rubber; one-seventh of a penny per gal. for rubber latex not exceeding 40 per cent. rubber by weight; one-fifth of a penny per gal. when the percentage of rubber is between 40 and 70 per cent.; and in respect of rubber latex exceeding 70 per cent. rubber by weight one thirty-fifth of a penny for every lb. or part of a lb. on net weight.

From January 1, 1934, the rates will be assessed by the association for the year in which they become payable to amount in the aggregate, as nearly as can be estimated, to £15,000.

British Celanese, Ltd., v. Courtaulds, Ltd.

Court of Appeal Hearing

IN the Court of Appeal, on Monday, May 8, the Master of the Rolls and Lords Justices Lawrence and Romer commenced the hearing of the appeal by the British Celanese, Ltd., from a judgment and order of Mr. Justice Clauson in favour of Courtaulds, Ltd.

Mr. Justice Clauson dismissed the action against Courtaulds. British Celanese alleged infringement of three letters patent for evaporative or dry spinning of cellulose acetate artificial silk.

Mr. Justice Clauson held that the three patents were invalid and should be revoked.

Sir Arthur Colefax, K.C., Mr. Craig Henderson, K.C., Mr. E. J. Neap and Mr. H. D. Russell Clark appeared for the British Celanese, Ltd., and Mr. J. Whitehead, K.C., Sir Stafford Cripps, K.C., Mr. Trevor Watson, K.C., and Mr. G. W. Tookey represented Courtaulds.

Sir Arthur, in opening the appeal, said he was going to keep his remarks quite apart in dealing with the three patents. At the outset he was going to confine himself to patent No. 165,519. The patents were all concerned with the manufacture of artificial silk. Counsel then proceeded to sketch a history of the progress of the manufacture of artificial silk from 1890.

The Master of the Rolls, interposing, said he was either a trustee or personally held some shares in Courtaulds, Ltd.

Sir Arthur was sure that would not be a consideration for his clients whatever the holding was.

Counsel then proceeded and said the plaintiff's artificial silk was known by the familiar name Celanese and in the manufacture of it they were undoubtedly pioneers. It was only recently that defendants had commenced the manufacture of acetate silk as a relatively small part of their output, the vast part being viscose silk. They had invaded the monopoly hitherto enjoyed by plaintiffs in this country in the manufacture of acetate silk. The manufacture of artificial silk was first attempted for the purpose of producing lengths of material for incandescent lamps by Swan who was associated with Edison.

Counsel's submission was that the plaintiffs were the first company who got complete evaporation. The judge in the court below found that in the state of the art there was no invention and that there was an absence of subject matter. He (counsel) was going to submit that the judge was wholly wrong in law, and there was no art or common knowledge.

On Tuesday, Sir Arthur Colefax continued his speech and referred to the letter written in 1920 saying what was taking place at plaintiffs' works. The process resulted in a successful manufacture from that date. Prior to this there was no knowledge as to the process. It was entirely produced upon the process which was the subject of the patent.

Dealing with the plaintiffs' claim that there was an inventive step in downward spinning, counsel said there was a marked divergence of view among the experts called by each side as to the fundamentals of the change from upward to downward spinning. He did not wish to suggest, however, that this constituted the inception of the invention. His submission was that downward spinning was a real inventive step and its utility had never been questioned. In the art as now practised a spinning speed had been attained six times greater than that formerly known.

The judge in the court below held that in the state of art such a process was not patentable; that in view of Clark's specification (which, however, was not an anticipation of the invention) coupled with common knowledge, there was no patentability and lastly that there had been complete anticipation by one specification.

Counsel said he would first deal with the evidence given before Mr. Justice Clauson and then offer his observations in the conclusions the learned judge arrived at.

He then proceeded to read the evidence, commenting upon it as he proceeded.

On Wednesday, Sir Arthur dealt with the question of whether downward spinning was obviously practicable in artificial silk manufacture in 1920 and submitted that the evidence and extraneous facts afforded abundant evidence that there was nothing obvious about the process. Viewed as a matter of physics the matter was an obvious art. Different considerations came into play in upward and downward spinning. The question for the Court was whether it could possibly be said that the plaintiffs' process contained an evaporative invention. There was no indication at all that it had been appreciated in any other evaporative process. Another step in the process was outside winding of the filament which was possible by producing a dry product solidified by evaporation in its travel. This was an important departure in the process known at that date. He disputed the allegations of the defendants of common general knowledge of the plaintiffs' process and the physical facts which constituted the invention.

The hearing was adjourned.

Boots Pure Drug Co.

Preliminary Statement for 1932-33

FROM the preliminary statement issued by Boots Pure Drug Co. on May 4, it is evident that the forthcoming report for the year ended March 31 last, will reveal a very satisfactory position. Net earnings are not up to the level of the previous year, but a reduction of £30,000 now reported is by no means a serious matter when earnings exceed, as they do in this case, £700,000. On the contrary, it may justly be claimed a creditable performance having regard to the exceptional difficulties encountered by every branch of industry during the year. Net earnings, subject to audit, amount to £701,453, compared with £731,890 reported for the previous year, this total being arrived at after providing for income-tax, depreciation and the staff pension fund. The usual quarterly interim dividend of 6 per cent. has been paid on the ordinary shares, making 24 per cent. for the year, and the directors now announce a bonus of 1s. per share. The total distribution, therefore, is maintained at 29 per cent., of which 5 per cent. is paid tax free, and the balance less tax. No reference is made in the preliminary statement to allocations to the reserve funds, but as earnings largely exceed the cost of dividends, it is to be presumed that those funds are to be still further strengthened. Last year £100,000 was transferred to the general reserve, and the works development fund received a similar allotment, which raised the totals to £1,400,000 and £140,000 respectively. The dividends on all classes of capital will absorb £531,750, so that out of the past year's earnings approximately £170,000 remains for disposal. In addition, there is the balance of £220,484 brought forward from the previous year.

Honouring Huxley's Will

Professor Armstrong's Memorial Lecture

PROFESSOR H. E. ARMSTRONG gave the Huxley Memorial Lecture at the Imperial College of Science and Technology on May 5, his subject being "Our Need to Honour Huxley's Will." The lecturer mentioned that Huxley on his return from his Australian expedition seemed to have been overmastered by his craft; he became a severely scientific, comparative morphologist, intensely interested in tracing out affinities—in fact, moulding his mind to appreciate Darwin's evolutionary philosophy. Though highly skilled as a minute anatomist and as a close observer of structure, he was never an experimentalist, but essentially a didactic teacher, with a marked tendency to pontificate. Had he been otherwise, more consciously formative and persuasive as a teacher, his influence would have been far greater; he would have secured more than a select following of intimates. After 35 years' closest experimental study, Professor Armstrong continued, he was satisfied that, from Huxley onwards, we had all been too sanguine in the expectation that "scientific education" could be made palatable to the many.

An Unforeseen Fatality

Precaution Against Evaporation of Stock Solution

A REMARKABLE story was revealed at an adjourned inquiry by the District Coroner at Camborne on May 2, into the death of Miss Victoria Maud Camelia Rowe, who died from an over-dose of phosphorus administered in pill form. The British Drug Houses, Ltd., by whom the pills were manufactured were represented by Mr. H. G. Jones, of London.

Dr. R. Blair, of Camborne, prescribed a tonic pill for Miss Rowe. This pill contained phosphorus and zinc compound and an extract of valerian. He supplied some of these pills to Miss Rowe and a similar quantity to her sister. When he made his weekly visit Miss Rowe, who, if she had followed his instructions, would have taken eight or nine of the pills, was depressed, and the following morning he received an urgent message that both Miss Rowe and her sister were acutely ill. He first suspected food poisoning but began to suspect the pills as a third patient was suffering similarly. He continued to attend Miss Rowe but she gradually weakened and died; her sister, however, recovered.

Mr. Richard R. Bennett, B.Sc., F.I.C., a director of The British Drug Houses, Ltd., said the firm were extremely careful to maintain their high reputation. They manufactured between 40 and 50 million pills annually and this was the first case they had of mis-dispensing. He was quite satisfied that the stock solution was made correctly in the first place. It had been made two months and the conclusion he had come to was that the excess of phosphorus could only have been caused by the evaporation of the carbon bisulphide, and that the stock solution had thereby increased its strength concentration. The only thing that could have happened was that the stopper had not been replaced tightly enough and the pressure of the gas from the contents had raised it and allowed the evaporation.

Mr. Glynn Jones said it was surprising to find that such a small over-dose as was contained in these particular pills should have caused even serious symptoms let alone fatal result. He agreed that it was generally recognised that the minimum fatal dose of phosphorus was something like three-quarters to one grain.

After a brief consultation with the jury, the Coroner returned a verdict of "Death by misadventure."

New Dyestuff Licences

Applications in April

THE following statement relating to applications for licences under the Dyestuffs (Import Regulation) Act, 1920, made during April, has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee. The total number of applications received during the month was 505, of which 462 were from merchants or importers. To these should be added ten cases outstanding on March 31, making a total for the month of 515. These were dealt with as follows: Granted, 501 (of which 491 were dealt with within seven days of receipt). Referred to British makers of similar products, 13 (of which 11 were dealt with within seven days of receipt); outstanding on April 29, one. Of the total of 515 applications received, 502 or 97 per cent. were dealt with within seven days of receipt.

Nobel Prizewinner Resigns

PROFESSOR FRITZ HABER, a noted chemist and Nobel prize-winner, has resigned his position as head of the Department of Physical Chemistry at the Kaiser Wilhelm Institute Institute in Berlin. It is stated that Germany owed her ability to continue the war for more than four years to Professor Haber more than to any other man. But for his synthesis of ammonia she would much sooner have found it impossible to supply either food for her people or explosives. It was also due to Professor Haber's chemical knowledge that Germany was able to start gas warfare.

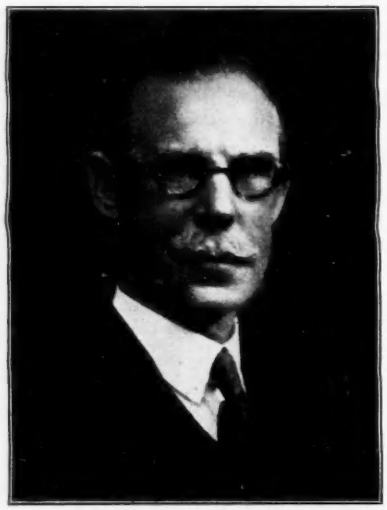
IT is reported that the Chorzow State plant has undertaken the manufacture of a super basic slag in powdered form alleged to be an improvement over the regular basic phosphate slag.

The Argentine Agreement

A Steady Increase of Exports Anticipated

THE full terms of the Argentine Trade Agreement are even more favourable than was expected, as it not only provides for the release of British funds awaiting remittance from the other side but also ensures prompt payment for current purchases from this country. The concessions which Mr. Runciman has made in connection with meat are small compared with the advantages obtained for the British investor and exporter, and critics of the agreement must not forget that it has, in fact, saved the huge capital sum of over £500,000,000 from further depreciation. Nor is this all, for certain duties on goods entering Argentina are to be reduced in our favour, so that the British manufacturer will enjoy an actual preference in this market for the future.

The successful outcome of the discussions with the Mission from Argentina has crowned the efforts of the past two years, begun at the Buenos Aires Exhibition, to increase British trade. In recent months there has been a distinct improvement in British exports to Argentina and the agreement should bring a steady increase during the coming summer. Confidence in the future of Argentina was shown by the publishers of THE CHEMICAL AGE in founding "Industria Britanica" to provide British propaganda in the Spanish language, and its importance as a link between the two countries was recognised by the vice-president of the Argentine Republic, Dr. Julio Roca, at the luncheon given to the Mission by Benn Brothers, Ltd., on the day that the negotiations began at the Board of Trade. To celebrate their successful conclusion a special number of "Industria Britanica" will be published shortly, and offers an excellent opportunity to exporters, as it will be circulated throughout Argentina at the moment when buyers will be turning afresh to British supplies on the favourable basis of the agreement.



MR. J. ARTHUR REAVELL

Who has just retired from the Chairmanship of the Chemical Engineering Group of the Society of Chemical Industry after a successful year's service. During his term of office, Mr. Reavell has strongly advocated the "Buy British" movement among users of chemical plant

Nitrogen Production in Belgium

THE annual capacity of the synthetic nitrogen plants in Belgium is placed at 250,000 metric tons, or the equivalent of 1,250,000 tons of ammonium sulphate. The 1932 production of ammonium sulphate totalled almost 255,000 tons, of which approximately 55,000 tons were by-product. Home consumption was 162,000 tons.

Chemical Notes from Overseas

Indian Oil Seeds Cess

THE Indian Oil Crushing Industry Committee of the Imperial Council of Agricultural Research, India, has decided to impose a cess on oil seeds of 4½d. per ton, and also to set up a bureau of information and statistics, and a central committee for oil seeds to manage the cess receipts. The committee will have a technical secretary to guide its work. It is estimated that the revenue from the cess will amount to nearly £37,500.

New Lithopone Plant in Hungary

THE Metallhandels A.G., of Budapest, has erected a lithopone plant at its Nagytetenyer works. The capacity of the plant is reported to be adequate to cover the whole of the domestic needs. Operation of the plant is expected to start in April. Imports of lithopone into Hungary in 1930 amounted to 1,238 tons which declined to 552 tons during 1931. The chief countries of origin were Germany, Netherlands, Czechoslovakia, and Poland.

Belgian Chemical Trade Declines

BELGIUM has assumed considerable importance in the world's chemical business, and is one of the largest producers and exporters of superphosphates, basic slag, white lead, zinc oxide, lithopone, and linseed oil. In 1931 Belgium was one of the few countries whose foreign trade in chemicals and allied products was particularly favourable and exceeded the 1930 figure. This trend failed to continue in 1932, however, and exports valued at £7,600,000 were 28 per cent. less than in 1931. Imports showed a still larger decline, having dropped 40 per cent. to £5,200,000 in 1932. Production of chemicals was maintained, and indeed, a few commodities increased. Superphosphate production, for example, increased to over 350,000 tons from 300,000 tons in 1931, while output of coal tar products, sulphuric acid, and sodium carbonate declined relatively little.

Irish Chemical Trade

RETURNS of Irish Free State trade for the first three months of this year reveal a considerable drop in the importation of chemicals and chemical products. The total value in the January-March period was £213,332, as against £279,003 in the corresponding three months of last year. Imports under this heading during last March totalled £88,216, as compared with £105,717 in March, 1932. Chemical fertilisers imported into the Free State during the first quarter of the year were valued at £92,349; in the corresponding period of last year the value was £229,712. The imports during March amounted to £33,437, as compared with £90,577 in March, 1932. Exports of chemical products dropped by approximately £10,000 in the first three months of the year and were valued at £11,129, as against £21,006 in the same months of last year, in March the value of the exports totalled £3,739, as compared with £7,156 in March, 1932.

Indian Heavy Chemical Industry

The Government of India has, after careful inquiries, decided to place no proposals before the legislature for the continuance of protection to the heavy chemical industry after March 31, 1933. The protective duty on magnesium chloride, which is in force until March, 1939, remains unaffected by this decision. Any scheme for the grant of State assistance to manufacture of superphosphate would clearly have no justification on any ground and in the absence of a superphosphate manufacturing industry, the additional market for sulphuric acid for which the Tariff Board hoped, failed to materialise. In the words of the Tariff Board, the chemical industry in India can have no future so long as manufacture is carried on in small units with low production, and no indication has appeared of any desire on the part of existing manufacturing interests to concentrate production into a small number of economic units for the supply of the existing market. In these circumstances, the only result of retaining protection on the heavy chemical industry, would be to perpetuate uneconomic manufacture and to place a burden on the consumer of such chemicals for an indefinite period with no prospect of any national advantage.

Mole Destruction in France

THE French Ministry of Agriculture has authorised the use of zinc phosphide under certain limitation for the destruction of moles. The Ministry will stipulate the infested zones. Preparation of the bait is to be effected under the supervision of the pharmaceutical inspection service.

German Exports of Magnesium Chloride

MAGNESIUM chloride exports by Germany declined in 1932 to 21,197 metric tons. Compared with the tonnage exported each year between 1928 and 1931 this represents a marked drop. British India is the largest of the more distant markets for German magnesium chloride, while 14 European countries are buyers of substantial quantities. Largest sales in 1932 were to Czechoslovakia, 3,600 tons; United Kingdom, 3,600 tons; Sweden, 2,400 tons; and Switzerland, 1,600 tons.

Production of Salt in South Africa

THE importation of salt in South Africa is now negligible, for the production of the local salt pans has been increased to meet requirements. Table salt of fair quality is now produced. It is free from chlorides of calcium and magnesium, and therefore does not absorb moisture from the atmosphere and become lumpy. The South African dairy industry has been served with a good grade of salt, which also has had the calcium and magnesium chlorides refined out of it. A large number of samples were recently submitted to the Government Chemist for analysis, and he stated that eleven of the samples were well up to standard, providing they were subjected to the necessary screening. Over a period of four years the quantity of salt produced in South Africa has increased from 92,301 tons to 98,479 tons, and the value of these products from £124,271 to £136,977. The value of the by-products has increased from £47 to £4,472.

Activity in Spanish Potash Industry

ALTHOUGH the Spanish chemical industry was not in as satisfactory a condition in 1932 as in 1931, there were some significant changes in the agricultural chemical line. Considerable development in the potash industry increased total production to around 60,000 tons of potassium oxide, with Spain and the United States tied for third place as world producers. Exports of potash salts from Spain more than doubled, to 66,000 tons, one third of which went to Sweden. Ammonium sulphate imports of 440,400 tons doubled the amounts received in 1931, and came chiefly from the United Kingdom, Germany, the Netherlands, and Belgium. Imports of other synthetic nitrogenous components advanced to 57,000 tons, of which 24,000 tons came from Norway and 17,100 from the United States. One half as much again of insecticides was imported in 1932, or 2,600 tons, 10 per cent. of which came from the United States.

Vegetable Ghee in India

THE principal problem discussed at a scientific exhibition organised in Bangalore under the auspices of the South India Science Association, the Society of Biological Chemists, India, the Indian Chemical Society, Madras branch, and the Indian Institute of Science, was that of ghee and vegetable substitutes. It was urged on one side that vegetable ghee was not a substitute for real ghee, but was a new product which could be used with the same benefit more cheaply without any reduction in food value, and that it was possible to manufacture it with more normal specifications. On the other hand, it was stated that the use of vegetable ghee was harmful because it did not contain linolic acid, which was very essential to bring about digestion. Lack of it resulted in a certain type of deficiency disease. Instead of vegetable products, the use of groundnut oil or cocoanut oil may be used as they contained linolic acid. The president of the conference, in summing up said that all the food values ascribed to butter ghee could be incorporated in the manufacture of vegetable ghee including the 5 per cent. of linolic acid stated to be so essential for digestion and vitamin A and D. He suggested the appointment of a committee to go into the question and suggest methods of tackling questions that arose out of the use of vegetable ghee.

News from the Allied Industries

Artificial Silk

THREE DIRECTORS of the Vereinigte Glanzstoff-Fabriken were arrested in Berlin on May 9. It is announced officially that they are charged with breaches of the commercial law and of falsification of balance sheets. They are Dr. W. Springorum, Dr. Fritz Blüthgen, chairman of the board of control, and Herr Carl Benrath. They are directors of many companies, including the British Bemberg, Ltd.

Matches

THE NET REVENUE of the British Match Corporation, which controls Bryant and May, and other important match manufacturing concerns, was well maintained in the past year, the total at £418,633 comparing with £442,597 for the year ended April 30, 1932. The dividend on the ordinary shares remains at 6 per cent., free of tax, and £40,000 is again written off goodwill, rights, etc. Although the previous year's addition of £50,000 to the reserve out of revenue is not repeated, this fund is nevertheless being increased from £50,000 to £200,000 as a result of a special bonus dividend received from Bryant and May. The balance carried forward at £39,379 compares with £54,186 brought in.

Paper

MEETINGS OF THE SHAREHOLDERS of the Inveresk Paper Co., Ltd., were held in London, on May 5, to consider resolutions sanctioning a scheme of reorganisation of the capital of the company, the details of which have already been made public. Mr. B. H. Binder, the chairman, who presided at the extraordinary general meeting of all classes, said the scheme had already received general approval. He must, however, point out that the earning capacity of the group, as shown by the accounts for 1932 recently submitted, indicated that there must be a very substantial increase in revenue before there was any surplus available for the ordinary shareholders, and it was in view of the leeway that had to be made up that the scheme provided for the first preference dividend to be non-cumulative up to January 1, 1935, and for the second preference dividend to be non-cumulative up to January 1, 1937.

Glass

SIR MAX J. BONN will preside over the third British Glass Convention, at Buxton, from May 18 to May 20. Sir Max is chairman of the United Glass Bottle Manufacturers, Ltd., the largest firm of bottle manufacturers in Europe.

Iron and Steel

MR. W. R. LYSAGHT, the newly-elected president of the Iron and Steel Institute, in his address at the annual meeting on May 4, said that against all present disturbing happenings they had the cheering fact that sheet steel was being used for an increasing number of purposes. He looked forward to the time when railway coaches would be all steel, and there was no reason why passenger ships should not be panelled, doored and furnished in steel. At this meeting the Bessemer Medal was presented to Dr. W. H. Hatfield, of Sheffield, for metallurgical research work.

Non-Ferrous Metals

ALTHOUGH THERE HAVE EXISTED for some years various trade associations representing certain sections of the copper industry, and a limited amount of development work had been done by those associations, as well as by individual firms, there has been no central co-ordinating development body for all branches of the industry. Such an organisation should be able to render very valuable assistance to producers and consumers alike. Careful direction of research work and the circulation from time to time of reports thereon would lead to an increased demand for the metal. The formation of a Copper Development Association is therefore a wise move. This step was decided on by the leading representatives of the copper trade, who were present at a meeting held in London under the chairmanship of Mr. A. Chester Beatty. The new association will have as its objects the collection of technical and cognate information on the use of copper, and the dissemination of this information to consumers and potential users of the metal.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Colouring Hardened Casein

HARDENED masses of casein can be coloured throughout by treatment with a solution of a compound which yields a coloured ion containing a heavy metal or which gives a colour reaction with casein. Substances mentioned are nickel, cobalt, copper, chromium, and uranium compounds, solutions of cuprammonium oxide, cobaltammines, cobalt-mercury thio-cyanate, alloxan, mercuric nitrate, alkaline copper sulphate (biuret reaction) and nitric acid, but not including dyes. Small quantities of electrolytes (acids, bases or salts) may be added to the solutions to assist penetration or may be incorporated in the casein before hardening. Marbled masses may be treated with the solutions to produce different effects; for instance, a marbled mass may be treated with a cuprammonium or a chromium salt solution to obtain other marbled effects. The coloured masses are more resistant to water than before. (See Specification No. 380,826 of Internationale Galalith-Ges. Hoff & Co.)

Cellulose Nitrate Coatings

NITROCELLULOSE coating compositions or films, not containing drying oils or alkyd resins modified by combination with drying-oil acids, can be rendered more resistant to ultra-violet light present in sunlight by incorporating an organic salt (other than a lake or dye) of iron, copper or cobalt, which is compatible with the nitro-cellulose and soluble in organic solvents. The films absorb ultra-violet-light and may transmit, for example, only 10 per cent. at 3130 A.U., or 25 per cent. for the entire range present in sunlight. The compositions may be clear lacquers, enamels, or plastics, and may form the connecting film in laminated glass. The quantity of the organic salt may be 1 part to 4 parts of nitrocellulose, and should seldom exceed 1 part to 1 part of nitrocellulose. Salts specified are ferric linoleate, the ferric salt of castor-oil acids, copper ethyl succinate, ferric butyl camphorate, ferric oleate, basic ferric acetate, ferric ethyl succinate, ferric naphthenate, ferric resinate, ferric abietate, copper abietate, and cobalt abietate. (See Specification No 380,518, of E. I. Du Pont de Nemours and Co.)

Specifications Accepted with Dates of Application

PROCESS FOR THE MANUFACTURE OF AN AZO DYESTUFF AND AN INTERMEDIATE PRODUCT THEREFOR.—A. Carpmael (I. G. Farbenindustrie). Sept. 14, 1931. 391,468.

CLEANSING AND SOFTENING AGENTS.—Imperial Chemical Industries, Ltd., and A. J. Hailwood. Sept. 21, 1931. 391,435.

APPARATUS FOR CLEANING OR DEGREASING MATERIALS.—J. Savage and Imperial Chemical Industries, Ltd. Sept. 24, 1931. 391,454.

MANUFACTURING CAUSTIC SODA.—P. Krassa. Nov. 4, 1930. 391,462.

PRODUCTION OF MONO-CALCIUM PHOSPHATE AND DI-CALCIUM PHOSPHATE.—E. I. Du Pont de Nemours and Co. Oct. 31, 1930. 391,495

MANUFACTURE OF POLYHYDRIC-ALCOHOL-POLYBASIC-ACID CONDENSATION PRODUCTS.—Imperial Chemical Industries, Ltd., and W. Baird. Nov. 4, 1931. 391,508.

PRODUCTION OF ZINC WHITE.—H. E. Coley. Nov. 13, 1931. 391,514.

DISTILLATION OF COMBUSTIBLE CARBONACEOUS MATERIALS.—G. F. M. Dupont and Physical Chemistry Research Co. Jan. 11, 1932. 391,545.

FILTER PRESSES, AND MORE PARTICULARLY TO A COMBINED FILTER AND HYDRAULIC PRESS.—A. L. Mond (I. G. Farbenindustrie). Jan. 29, 1932. 391,559.

MANUFACTURE AND PRODUCTION OF ADDITION COMPOUNDS OF FORMYL HALIDES.—J. Y. Johnson (I. G. Farbenindustrie). April 15, 1932. 391,600.

ESTERS OF CYCLOPENTENYLACETIC ACIDS.—Compagnie de Bethune. March 6, 1931. 391,579.

MANUFACTURE AND USE OF WETTING-OUT, EQUALISING, PEPTISING, AND CLEANSING AGENTS.—Deutsche Hydrierwerke Akt.-Ges. May 4, 1931. 391,610.

MANUFACTURE OF PRIMARY DISAZO DYESTUFFS.—W. W. Groves (J. R. Geigy Akt.-Ges.) June 2, 1932. 391,626.

MANUFACTURE OF CELLULOSIC MATERIAL.—H. A. Gardner. June 16, 1932. 391,632.

PRECIPITATION OF CELLULOSE ESTERS.—Kodak, Ltd. July 28, 1931. 391,656.

PROCESS FOR REFINING FATS, FATTY OILS, WAXES, AND THE LIKE.—L. Rosenstein and W. J. Hund. Aug. 21, 1931. 391,658.

CONVERSION OF ORGANIC SULPHUR COMPOUNDS.—Standard Oil Development Co. Sept. 18, 1931. 391,660.

PROCESS FOR THE MANUFACTURE OF PURIFIED GERM GLAND PREPARATIONS.—Schering-Kahlbaum Akt.-Ges. Oct. 17, 1931. 391,686.

PROCESS FOR MOULDING NON-PLASTIC METALLIC OXIDES.—Siemens and Halske Akt.-Ges. Oct. 29, 1931. 391,703.

MANUFACTURE OF PHENOL ESTERS OF SULPHONATED PHTHALIC ACIDS.—Soc. of Chemical Industry in Basle. Dec. 18, 1931. 391,715.

PROCESS FOR REMOVING IRON FROM SOLUTIONS OF CHROMIUM SALTS.—J. R. Geigy Akt.-Ges. Dec. 29, 1931. 391,720.

METHOD OF PRODUCING VOLUMINOUS TABLE SALT FROM FUSED ROCK SALT.—O. Englert, W. Becker, and K. Seidl. Jan. 27, 1932. 391,722.

PROCESS FOR THE MANUFACTURE OF N-ALLYL- AND N, N^1-DIALLYL-*C*, *C*-DISUBSTITUTED BARBITURIC ACIDS.—F. Hoffmann-La Roche and Co. Akt.-Ges. Feb. 29, 1932. 391,741.

Applications for Patents

INCREASING MOISTENING POWER OF MERCERISING SOLUTIONS.—Erba Fabrik Chemischer Produkte Spezialitäten für Die Textilindustrie. April 26. (Germany, April 27, '32.) 12187.

MANUFACTURE OF AMINES.— J. Y. Johnson (I. G. Farbenindustrie.) April 26. 12218.

MANUFACTURE OF METAL-ORGANIC COMPLEX COMPOUNDS.—J. Y. Johnson (I. G. Farbenindustrie). April 27. (Jan. 7, '32.) 12336.

PROCESS OF DYEING LEATHER, ETC., WITH SULPHUR DYESTUFFS.—I. G. Farbenindustrie. April 24. (Germany, June 30, '32.) 11913.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. April 25. (Germany, April 25, '32.) 12092.

SENSITISATION OF PHOTOGRAPHIC EMULSIONS.—I. G. Farbenindustrie. April 26. (Germany, April 26, '32.) 12182.

MANUFACTURE OF 3-OXYSELENONAPHTHENE, ETC.—I. G. Farbenindustrie. April 26. (Germany, April 27, '32.) 12183.

MANUFACTURE OF ACETYL-CHLORIDE.—I. G. Farbenindustrie. April 28. (Germany, April 29, '32.) 12412.

AZO DYES.—Imperial Chemical Industries, Ltd. April 24. 11982.

MANUFACTURE OF ALIPHATIC ALDEHYDES, KETONES, AND CARBOXYLIC ACIDS.—T. Kane and E. H. Strange. April 26. 12222.

DISTILLATION OF READILY VOLATILISABLE METALS.—F. Grupp Grusonwerk Akt.-Ges. April 25. (April 19, '32.) (Germany, Feb. 12, '32.) 12079.

CHLORINATING HYDROCARBONS.—L. A. Levy. April 24. 11899.

PRODUCING PROTECTIVE GASES FOR HEAT TREATMENT OF METALS.—A. G. Lobley. April 29. 12482.

MANUFACTURE OF COMPOUNDS OF CAFFEINE AND CUPREINE DERIVATIVES.—W. Lohmann. April 29. 12528.

AZO DYES.—M. Mendoza. April 24. 11982.

THERMOSTATIC CONTROL DEVICES FOR GAS OVENS, ETC.—Messenger and Sons (Birmingham), Ltd. April 29. 12516.

TREATMENT OF WATER.—L. M. Salerni. April 28. 12467.

CONVERTING PHENOLIC BODIES AND LOW-TEMPERATURE TARS INTO HYDROCARBONS.—Soc. des Carburants Synthétiques. April 25. (France, May 11, '32.) 12062.

MANUFACTURE OF ARTIFICIAL MASSES.—Soc. of Chemical Industry in Basle. April 26. (Switzerland, April 27, '32.) 12181.

MANUFACTURE OF A PEROXIDE FROM TETRAHYDRONAPHTHALENE.—Soc. of Chemical Industry in Basle. April 28. (Switzerland, April 29, '32.) 12411.

CENTRIFUGAL TREATMENT OF LIQUIDS.—J. Stone and Co., Ltd. April 26. 12179.

MAKING MAGNESIUM HYDROXIDE.—American Zinc, Lead and Smelting Co. May 3. (United States, May 24, '32.) 12901.

AMMONIUM COMPOUNDS.—Atmospheric Nitrogen Corporation. May 5. (United States, May 13, '32.) 13186.

AMMONIUM COMPOUNDS.—Atmospheric Nitrogen Corporation. May 5. (United States, Jan. 21.) 13187, 13188, 13189, 13190.

PHOTOGRAPHIC PROCESSES EMPLOYING BICHROMATED COLLOIDS.—Autotype Co., Ltd. May 3. 12936.

PASTEURISATION OF MILK.—C. S. Bedford. May 1. 12586.

ADHESIVE SUBSTANCES CONTAINING NITRO-CELLULOSE.—A. Beuteli. May 5. (Switzerland, May 13, '32.) 13192.

BLEACHING VEGETABLE FIBRES.—H. T. Böhme A.-G. May 2. (Germany, June 29, '32.) 12811.

APPLICATION OF ADHESIVES, ETC., COATINGS TO BOOT PARTS, ETC.—British United Shoe Machinery Co., Ltd. (United Shoe Machinery Corporation) G. Hazleton and F. Ricks. May 3. 12842.

COATING MATERIAL WITH ADHESIVE, ETC.—British United Shoe Machinery Co., Ltd., and E. Hope. May 6. 13222.

MANUFACTURE OF DETERGENT, ETC., AGENTS.—A. Carpmael (I. G. Farbenindustrie). May 2. 12828.

MANUFACTURE OF VIOLET SULPHUR DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie). May 5. 13162.

MANUFACTURE OF ACID-DYEING WOOL DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie). May 5. 13163.

MANUFACTURE OF HYDROCHLORIC ACID, ETC.—Chemical and Metallurgical Corporation, Ltd. and S. B. Casson. May 3. 12896.

RECOVERY OF SULPHUR DIOXIDE FROM GAS MIXTURE.—A. M. Clark and Imperial Chemical Industries, Ltd. May 3. 12960.

PRODUCTION OF CARBON-DIOXIDE ICE.—G. D. G. Cribb and W. H. Whitby. May 5. 13159.

VAPOURISERS FOR CONDITIONING HYDROCARBON OILS AS FUEL.—Crocker-Wheeler Electric Manufacturing Co. May 3. (United States, May 9, '32.) 12903.

MEANS FOR KEEPING LIQUIDS AND SOLIDS IN SUSPENSION IN COMBUSTIBLE FLUIDS.—E. L. Dodds. May 2. 12754.

PRODUCTION OF DYES ON THE FIBRE.—E. I. Du Pont de Nemours and Co. May 1. (United States, April 30, '32.) 12627.

MANUFACTURE OF RESINOUS PRODUCTS.—E. I. Du Pont de Nemours and Co. May 3. (United States, May 3, '32.) 12953, 12954.

MANUFACTURE OF AZO DYESTUFFS.—E. I. Du Pont de Nemours and Co. May 4. (United States, May 4, '32.) 13054.

PURIFICATION OF LIQUID HYDROCARBONS.—Edeleanu Gas. May 2. (Germany, May 4, '32.) 12807.

MANUFACTURE OF FILMS FROM CELLULOSE DERIVATIVES, ETC.—G. Frenkel. May 3. 12837.

PICKLING METALS, ETC.—Grasselli Chemical Co. May 4 (United States, May 4, '32.) 13076.

CONCENTRATION OF SOLID PARTICLES SUSPENDED IN WATER, ETC. C. Greaves. May 6. 13220.

CLARIFYING WATER, ETC., CONTAINING SOLID PARTICLES.—C. Greaves. May 6. 13221.

ANTI-FOULING PAINTS, ETC.—W. W .Groves (Holzapfel). May 5. 13150.

MANUFACTURE OF CYANINE DYES, AND THEIR USE IN PHOTOGRAPHY.—F. M. Hamer and Kodak, Ltd.. May 2. 12801.

DERIVATIVES OF DI-HYDROXY-BENZENES, ETC.—F. Hoffmann La Roche and Co., Akt.-Ges. May 1. (Germany, May 14, '32.) 12612.

MANUFACTURE OF C C-PHENYLETHYL-*N*-N-PROPYL-BARBITURIC ACID.—F. Hoffmann La Roche and Co., Akt.-Ges. May 5. (Germany, June 30, '32.) 13185.

PHOTOGRAPHIC PRINTING.—I. G. Farbenindustrie. May 1. (Germany, April 30, '32.) 12630.

MANUFACTURE OF DYESTUFFS, ETC.—I. G. Farbenindustrie. May 1. (Germany, April 29, '32.) 12631.

MANUFACTURE OF ACETYL CHLORIDE.—I. G. Farbenindustrie. May 1. (Germany, April 30, '32.) 12646.

MANUFACTURE OF ARTIFICIAL MASSES.—I. G. Farbenindustrie. May 3. (Germany, May 23, '32.) 12909.

MANUFACTURE OF VAT DYESTUFFS.—I. G. Farbenindustrie. May 4. (Germany, May 4, '32.) 13025.

SENSITISATION OF PHOTOGRAPHIC EMULSIONS, ETC.—I. G. Farbenindustrie. May 5. (Germany, May 6, '32.) 13149.

MANUFACTURE OF ORGANIC DYESTUFFS.—J. Y. Johnson (I. G. Farbenindustrie. May 6. 13242.

METALLIC ALLOYS.—Kinzoku Zairyo Kenkyusho. May 6. (July 2, '32.) (Japan, April 15, '32.) 13236.

MANUFACTURE OF ALUMINIUM ALLOYS.—E. H. Moore. May 6. 13205.

MANUFACTURE OF MIXED ETHERS OF HIGHER ALCOHOLS, ETC.—Naamlooze Vennootschap Chemische Fabriek Servo and M. D. Rozenbroer. May 1. (Holland, May 2, '32.) 12653.

MANUFACTURE OF MIXED ETHERS OF HIGHER ALCOHOLS, ETC.—Naamlooze Vennootschap Chemische Fabriek Servo and M. D. Rozenbroer. May 1. (Holland, May 2, '32.) 12654, 12655, 12656.

PRODUCTION OF CARBON DIOXIDE ICE.—Naamlooze Vennootschap Midden-Europeesche Octrooi-Maatschappij. May 5. (United States, May 16, '32.) 13160.

PHOTOCHEMICAL METHODS OF PLACING DESIGNS ON FABRICS.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 1. (Holland, Feb. 7.) 12633.

STERILE AND SELF-STERILISING ORGANIC FIBROUS PRODUCTS.—P. Pick. May 1. 12671.

PLANT FEEDER OF FERTILISER.—J. E. Stringer. May 4. 12980.

METHOD OF PREPARING SALTS OF ALIPHATIC ACIDS.—W. J. Tennant (Dow Chemical Co.). May 3. 12917.

ACCELERATED MERCURIAL EMANATION.—A. Tierce. May 6. 13252.

REMOVING RUST FROM AND PICKLING IRON, ETC.—Vereinigte Stahlwerke A.-G. May 3. (Germany, May 3, '32.) 12911.

MANUFACTURE OF PIGMENTED PROTECTIVE COATINGS.—Weeks and Co. (London), Ltd. May 6. (France, May 10, '32.) 13275.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THE following market report is based on information supplied by the British manufacturers concerned, and unless otherwise qualified the figures quoted apply to fair quantities, net and naked at makers' works. Where no locality is indicated, the prices are general for the United Kingdom. Particulars of the London chemical market are specially supplied to THE CHEMICAL AGE by R. W. Greeff and Co., Ltd., and Chas. Page and Co., Ltd., and those of the Scottish chemical market by Chas. Tennant and Co., Ltd.

THE demand for chemical products in the London market during the past week has been up to usual average and markets on the whole show very little change. In the coal tar products market, inquiry is lacking and prices, therefore, remain about the same. Some sellers on the Manchester market report a little more inquiry for certain chemical products during the past week and the general tone seems to be rather more cheerful than during recent weeks. On the whole, a fair aggregate quantity of chemicals, mainly the heavy materials, is being called for by users in the district. With regard to prices, these are quite steady in the majority of cases and here and there the tendency is towards higher levels. Business in the Scottish market again shows a tendency to briskness with, however, no sign of increased quantities.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80% £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £26 10s. per ton; B.P. crystals, £35 10s.; B.P. powder, £36 10s. in 1-cwt. bags d/d free Great Britain in 1-ton lots upwards.

ACID, CHROMIC.—11d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—LONDON: 9½d. per lb.; less 5%. MANCHESTER: 9¾d.

ACID, CRESYLIC.—97/99% 1s. 3d. to 1s. 7d. per gal.; 99/100% 1s. 7d. to 2s.

ACID, FORMIC.—LONDON: £50 per ton.

ACID, HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £45; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 7s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £49 to £52 ex store. MANCHESTER: £48 to £51 ex store.

ACID, SULPHURIC.—Average prices f.o.r. British makers' works, with slight variations owing to local considerations; 140° Tw. crude acid, £3 per ton; 168° Tw. arsenical £5 10s.; 168° Tw. non-arsenical, £6 15s. SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—11d. per lb. SCOTLAND: B.P. crystals, 10¾d., carriage paid. MANCHESTER: 11½d.

ALUM.—SCOTLAND: Lump potash, £9 per ton ex store.

ALUMINA SULPHATE.—LONDON. £8 5s. to £9 10s. per ton. SCOTLAND: £8 to £8 10s. ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £32 per ton; powdered, £34, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £19 to £20. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £24 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £19 c.i.f. main U.K. ports for imported material; Cornish nominal, £23 f.o.r. mines. SCOTLAND: White powdered, £25 ex wharf. MANCHESTER: White powdered Cornish, £23 at mines.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London, packages free.

BLEACHING POWDER.—Spot 35/37% £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 15s. in 5/6 cwt. casks.

BORAX, COMMERCIAL.—Granulated, £15 10s. per ton; powder, £17 packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—3s. to 3s. 4d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3½d. to 5½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10d. to 10½d. per lb., according to quantity d/d U.K. Green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb. Liquor, £19 10s. per ton d/d

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 per cwt.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £28 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £36; brown, £1 per ton less. MANCHESTER: White, £31 10s.; brown, £30 10s.

LEAD NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £28 10s. per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £40 per ton, carriage paid.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial 1s. 8d. to 2s. 3d. per gal. Pyridinised Industrial, 1s. 10d. to 2s. 5d. Mineralised, 2s. 9d. to 3s. 3d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£52 per ton d/d.

NICKEL SULPHATE.—£52 per ton d/d.

PHENOL.—9d. to 10d. per lb. nominal.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £40 to £42.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5¾d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—3¾d. per lb. ex wharf London in 1-cwt. kegs. LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100% powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 8¼d. B.P., 8¾d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 9d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags, special terms for contracts.

SODA, CAUSTIC.—Solid 76/77° spot, £14 5s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 15s. in casks, Solid 76/77%, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23 to £24.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 10s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. with discounts for quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. less 1 to 3½% contracts, 4d. spot lots.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 per ton.
SODIUM CHROMATE.—3⅝d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.
SODIUM NITRITE.—Spot, £19 to £22 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£12 10s. per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.
SODIUM SILICATE.—140° Tw. Spot £8 5s. per ton d/d station, returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground Spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £15 per ton f.o.b.
SULPHUR.—£11 15s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 1d. to 4s. 6d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.
ZINC SULPHIDE.—11d. to 1s. per lb.

Pharmaceutical and Fine Chemicals

ACID, TARTARIC.—11½d. per lb.
ACID, CITRIC.—9½d. per lb.
PHENACETIN.—4s. to 4s. 9d. per lb.
POTASSIUM BITARTRATE 99/100% (cream of tartar).—80s. per cwt.
SODIUM POTASSIUM TARTRATE (Rochelle Salt).—70s. per cwt.
TARTAR EMETIC B.P.—3s. 9d. to 4s. 6d. per lb.

Essential Oils

BERGAMOT.—6s. 6d. per lb.
CAMPHOR.—Brown, 80s. per cwt. White, 85s. per cwt.
CINNAMON.—3s. 9d. per lb.
CITRONELLA, JAVA.—2s. 9d. per lb. CEYLON: 2s. 3d. per lb.
LAVENDER, MONT BLANC, 38/40%.—10s. per lb.
LEMONGRASS.—3s. per lb.
PEPPERMINT, JAPANESE.—6s. 6d. per lb.
SANDALWOOD, AUSTRALIAN.—15s. 3d. per lb.

Intermediates and Dyes

IN the following list of intermediates delivered prices include packages except where otherwise stated:—
ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.
p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 8d. per lb.; 66/68° C. 8¾d. per lb.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags; £79 15s. in casks, in 1-ton lots.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
o-NITRANILINE.—5s. 10d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.
p-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.
m-XYLIDINE ACETATE.—3s. 4d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 9d. to 10d. per lb.; crude, 60's, 1s. 11d. to 2s. per gal.; 2% water, 3s. 0¾d. MANCHESTER: Crystals, 9½d. per lb.; crude, 2s. 6d. per gal. SCOTLAND: 60's, 1s. 7d. to 1s. 8d.
ACID, CRESYLIC.—99/100%, 11d. to 1s. 8d. per gal.; pale 95%, 11d. to 11½d.; dark, 10d., all according to specification; refined, 1s. 7d. to 1s. 8d. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.
ANTHRACENE OIL.—Strained, 4½d. per gal.
BENZOL.—At works, crude, 10d. to 11d. per gal.; standard motor, 1s. 6½d. to 1s. 7d.; 90%, 1s. 7d. to 1s. 8d.; pure, 1s. 10d. to 1s. 11d. LONDON: Motor, 1s. 7½d. SCOTLAND: Motor, 1s. 6½d. to 1s. 7½d.; 90%, 2s. 0½d. to 2s. 1½d.
CREOSOTE.—B.S.I. Specification standard, 2½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4½d. London. MANCHESTER: 2½d. to 3½d. SCOTLAND: Specification oils, 3¾d. to 4½d.; washed oil, 4d. to 4½d.; light, 3¾d. to 4½d.; heavy, 4½d. to 5d.
NAPHTHA.—Solvent 90/160%, 9d. to 1s. 2d. per gal.; 95/160%, 1s. 7d. to 1s. 8d.; 90/160%, 1s. 1d. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Crude, Hot-Pressed, £6 1s. 3d. per ton. Flaker, £10 per ton. Purified crystals, £9 10s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 65s. to 70s.
PITCH.—Medium soft, £4 5s. to £4 10s. per ton. MANCHESTER: £4 to £4 7s. 6d. f.o.b. LONDON: £4 to £4 2s. 6d. f.o.b. East Coast port.
PYRIDINE.—90/140, 3s. 9d. per gal.; 90/160, 4s. to 4s. 6d.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160% 4s. to 5s.; 90/220%, 3s. to 4s.
REFINED COAL TAR.—SCOTLAND: 4¾d. to 5d. per gal.
XYLOL.—Common, 1s. 11d. to 2s. per gal.; pure, 2s. to 2s. 2d.
TOLUOL.—90%, 1s. 11d. to 2s. per gal.; pure, 2s. 3d.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 15s. to £9 per ton. Grey £14 to £15. Liquor, brown, 30° Tw., 6d. per gal. MANCHESTER: Brown, £9 10s.; grey £14 10s.
ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.
AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.
CHARCOAL.—£6 to £11 per ton.
WOOD CREOSOTE.—6d. to 2s. per gal., unrefined.
WOOD NAPHTHA, MISCIBLE.—2s. 7d. to 4s. per gal. Solvent, 3s. 9d. to 4s. 9d. per gal.
WOOD TAR.—£2 to £6 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Export, £6 per ton f.o.b. U.K. ports in single bags; home, £6 10s. per ton, delivered in 6-ton lots to consumer's nearest station.
NITRATE OF SODA.—£8 16s. per ton, delivered in 6-ton lots to consumer's nearest station.
CYANAMIDE.—£7 per ton, delivered in 6-ton lots to consumer's nearest station.
NITRO-CHALK.—£7 5s. per ton, delivered in 6-ton lots to consumer's nearest station.
CONCENTRATED COMPLETE FERTILISERS.—£10 9s. 6d. to £11 per ton according to percentage of constituents.

Latest Oil Prices

LONDON, May 10.—LINSEED OIL was steady. Spot, small quantities, £20 10s.; May, £17 12s. 6d.; June-Aug., £17 15s.; Sept.-Dec., £18 7s. 6d., naked. RAPE OIL was quiet. Crude extracted, £28; technical refined, £29 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £19 10s.; refined common edible, £22 10s.; and deodorised, £24 10s., naked, ex mill. TURPENTINE was steady. American, spot, 61s. 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted £17 17s. 6d. per ton; May, £17 10s.; June-Aug., £17 15s.; Sept.-Dec., £18 5s. COTTON OIL, Egyptian crude, spot, £18 10s.; edible, refined, spot, £20 15s.; technical, spot, £20 15s.; deodorised, £22 15s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £19, naked. GROUNDNUT OIL, extracted, spot, £23 10s.; deodorised, £27 10s. RAPE OIL, extracted, spot, £26 10s.; refined, £28. SOYA OIL, extracted, spot, £19; deodorised, £22 per ton. COD OIL, June, 17s. per cwt. CASTOR OIL, pharmaceutical, spot, 38s.; first, 33s.; second, 30s. per cwt. TURPENTINE, American, spot, 62s. 9d. per cwt.

New Chemical Trade Marks

Compiled from official sources by Gee and Co., Patent and Trade Mark Agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to June 3, 1933.

Bipoule. 540,232. Class 3. Chemical substances prepared for use in medicine and pharmacy. May & Baker, Ltd. March 24, 1933.

Euron. 540,335. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. I. G. Farbenindustrie, Grüneburgplatz, Frankfort-on-Main, Germany. March 29, 1933.

Fluoflint. 539,880. Class 1. Paints, varnishes, enamels (in the nature of paint), colours, distempers, japans, lacquers, paint and varnish driers, wood preservatives, wood stains, anti-corrosive and anti-fouling compositions, and anti-corrosive oils. Pinchin, Johnson & Co., Ltd., General Buildings, Aldwych, London, W.C.2. March 14, 1933.

Leysynol. 540,212. Class 1. Paints, varnishes, enamels (in the nature of paint), colours, distempers, japans, lacquers, paint and varnish driers, wood preservatives, wood stains, anti-corrosive and anti-fouling compositions, and anti-corrosive oils. Leyland Paint and Varnish Co., Ltd., Northgate, Leyland, Lancashire. March 24, 1933.

Mackechnie. B535028. Class 1. Lithopone, being a chemical substance for use in manufactures. McKechnie Brothers, Ltd., The Metal Works, Rotten Park Street, Birmingham. September 17, 1932. User claimed from July 31, 1930.

Mestarine. 536,453. Class 3. Chemical substances prepared for use in medicine and pharmacy. May & Baker, Ltd. November 7, 1932.

Neptal. 536,452. Class 3. Chemical substances prepared for use in medicine and pharmacy. May & Baker, Ltd., Garden Wharf, Church Road, Battersea, London, S.W.11. November 7, 1932.

Rutonal. 536,454. Class 3. Chemical substances prepared for use in medicine and pharmacy. May & Baker, Ltd. November 7, 1932.

Stovarsol. 536,456. Class 3. Chemical substances prepared for use in medicine and pharmacy. May & Baker, Ltd. November 7, 1932.

Texsol. 538,650. Class 3. Chemical substances for use as scouring agents for textile fibres in the course of manufacture. British Dyestuffs Corporation, Hexagon House, Blackley, Manchester. January 28, 1933. (By consent.)

Trypoxyl. 536,457. Class 3. Chemical substances prepared for use in medicine and pharmacy. May & Baker, Ltd. November 7, 1932.

New Companies Registered

Arnold & Co. (Sales), Ltd. Registered May 6. Nominal capital £5,000 in 2,500 7½ per cent. cumulative preference and 2,000 ordinary shares of £1 and 10,000 deferred ordinary shares of 1s. each. Objects: To carry on the business of an agent for the sale of vermicides carried on by Enid Abrahams at 17 Plough Court, Fetter Lane, E.C. Directors are: Miss E. Abrahams, 121 Portsdown Road, Maida Vale, W., A. L. Arnold.

Bauer Process, Ltd., 16 Albemarle Street, W.1. Registered May 2. Nominal capital £100 in £1 shares. To exploit a special dyeing and cleaning process known as Faerbekunst which has been acquired by Ernst Burstein and Soltan Klein from "Faerbekunst" Gebruder Bauer, G. M. B. H., Unter den Linden 20, Berlin, W.8. Directors: E. Burstein (managing director), Unter Den Linden 20, Berlin, W.8, Germany, Mrs. E. Josephs.

Copeland & Jenkins, Ltd. Registered May 4. Nominal capital £3,000 in £1 shares. To experiment with, perfect, exploit, develop, work, finance and turn to account chemical or other processes for the manufacture and merchanting of mica and other minerals and metals; to deal in mica and other silicates, etc. A director: W. J. Chaney, Eldon Street House, Eldon Street, London, E.C.2.

East London Paint & Varnish Co., Ltd. Registered May 3. Nominal capital £1,000 in 500 8 per cent. cumulative preference shares of £1 and 1,000 ordinary shares of 10s. each. Manufacturers of and dealers in paints, varnish, enamel, polish, lacquer, shellac, cellulose, size, pigments, etc. The subscribers (each with one preference share) are:—H. Sealey, 2 Ridley Road, Forest Gate, E.7., and L. Johnson.

Eric Holloway (Chemists), Ltd. Registered May 5. Nominal capital £500 in £1 shares. Pharmaceutical, consulting, analytical, manufacturing, wholesale and retail chemists, etc. Directors: E. Holloway, Windmill House, Cradley, Staffs.; Mrs. A. Holloway, and J. H. L. Morgan.

H. Camish, Ltd. Registered May 5. Nominal capital £100 in £1 shares. Chemists, druggists, drysalters, oil and colourmen, etc. A subscriber: Geo. A. Deasley, 3 Kelfield Gardens, N. Kensington, W.10.

Company News

British Glues & Chemicals.—The directors have decided to pay on May 15 the half-year's dividend on the 8 per cent. cumulative participating preference shares.

Crosfields Oil & Cake Co.—The report for the year ended March 31, states that net profits amounted to £5,362 against £21,300 in the previous year. The directors recommend a dividend of 1s. per share, less tax. The amount carried forward is £2,024.

British Oil & Guano.—There was a loss for the year to March 31 last of £1,869. The balance at the debit of profit and loss at the end of the previous year was £197, and, after taking into account £159 tax recovered in respect of the previous year, the debit balance at the close of accounts is £1,907.

United Premier Oil & Cake Co., Ltd.—The profits amounted to £61,298 in 1932, compared with £81,756 in the previous year. After deducting debenture interest for the year 1932 and two years' preference dividend, there is a balance of £35,856 to go forward, compared with £53,377 brought in. In the previous year, 18 months' preference dividend was paid and the carry-forward increased by over £10,000.

Boots Pure Drug Co.—The directors announce that subject to audit the net profits for the year ended March 31, 1933, amounted to £701,453, as against £731,890 for the preceding year. In addition to the four interim dividends already paid amounting to 24 per cent., less tax, a bonus of 1s. per share, free of tax, will be paid to shareholders registered in the books of the company on May 5, 1933.

British Match Corporation, Ltd.—A divdend of 4 per cent., tax free, making 6 per cent. for the year is announced. This rate has been paid since the company's incorporation in 1927. The net revenue for the year to April 30 was £418,633, compared with £442,597 for the previous twelve months. Reserve has been raised to £200,000 by the addition of £150,000 from the special bonus dividend received from Bryant and May, and £40,000 is again allocated to write off goodwill, rights, etc.

E. I. du Pont de Nemours.—The net income for the three months ended March 31, was $5,480,515, against $9,689,433 for the first quarter of 1932, of which debenture interest takes $1,633,150. The amount earned on common stock is equal to $0.35 a share. Dividends on common stock for the quarter amount to $5,435,950. The accumulated surplus shows decline from $178,717,373 at December 31 last to $162,628,788, after debiting $14,500,000 for adjustment resulting from revaluation of investment in General Motors Corporation.

Forthcoming Events

May 16.—British Science Guild. Research and Development Lecture, 1933. "Metals in the Service of Human Life and Industry." Professor Sir Harold Carpenter. 4.30 p.m. Carpenters' Hall, Throgmorton Avenue, London.

May 18.—Chemical Society. 8 p.m. Burlington House, London.

May 19.—Physical Society. 5 p.m. Imperial College of Science, South Kensington.

May 19.—Electroplaters' and Depositors' Technical Society. "Testing of Cadmium Deposits." S. C. Clarke. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, London.

May 19.—National Institute of Industrial Psychology and the Office of Management Association. National Conference on Office Machinery. 10.30 a.m. Park Lane Hotel, London.

May 19.—British Association of Chemists (London Section). Annual general meeting. 7.15 p.m. followed by Smoking Concert. Broad Street Station Restaurant, London, E.C.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Canada.—A manufacturers' agent in Saint John, New Brunswick, also operating in Halifax, Nova Scotia, is desirous of securing the representation of United Kingdom manufacturers of alum, soda ash, liquid chlorine, rosin, sulphuric acid 66 per cent., and stainless steel. The agent is prepared to work on a commission, purchase or consignment basis, and covers Eastern Canada and Newfoundland. (Ref. No. 643.)

Denmark.—An agent established at Copenhagen wishes to obtain the representation, on a commission basis, of United Kingdom merchants of chicle gum. (Ref. No. 664.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Egyptian Government Assay Office is calling for tenders, to be presented in Cairo by July 11, 1933, for the supply of chemicals, etc., required for assay purposes. (Ref. F.X. 1766.)

France.—An agent, of Swiss nationality, established at Marseilles, wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of seed-oils, drugs and fibres. (Ref. No. 668.)

From Week to Week

A. F. CRAIG AND CO., Paisley, have secured an order for the equipment of a new sugar refinery in India.

MR. LEOPOLD ALBU has been elected a director and appointed chairman of Phoenix Oil Products, Ltd., in succession to the late Sir Edward Manville.

A PUBLIC MEETING, convened by the Mayor, has been held at Fowey, to consider the town's future policy in view of the dwindling of the china clay industry and the consequent serious reduction of shipping in the port.

AT A MEETING on May 5 of the Master Spinners' Federation General Committee, a report was presented on the Dyestuffs Act, 1920. It was decided to support the application of the Joint Committee of the Cotton Trade Organisations that the Act should be discontinued on its expiry in January next.

AS A RESULT of the tax on heavy oil imposed in the Budget, Coast Lines, Ltd., have cancelled orders placed at Ardrossan and Leith for two motor coasting vessels. The new duty of 1d. per gallon works out at about £1 per ton and in a statement the Coastal Trade Development Council states that the tax will force a return to coal.

MR. GEORGE WILLIAM MALCOLM (63), of Davenham House, Davenham, Cheshire, managing director of the Salt Union, Ltd., and of the Mersey Power Company, a director of the British Power and Light Corporation (1929), of the Electrical Distribution of North Wales and District, and of the North Wales Power Co., a magistrate for Cheshire, has left £16,899 (net personalty £11,678).

AT A MEETING of the board of the Institute of Physics held on May 9, the following were elected to membership :—Fellows : C. P. Black, A. Harvey, J. G. Pearce, M. O. Pelton, S. R. Rao, and J. M. Waldram. Associates : K. E. Grew, E. W. L. Leavey, A. S. L. Morgan, J. A. Morrow, A. C. Phillips, E. E. Spillett, and N. R. Tawdee. Student members : W. J. Sulston and H. M. Taylor.

A SILVER MEDAL, offered in a special class for all Irish manufactured goods at the recent Spring Show of the Royal Dublin Society, was won by Mr. John A. Burke, Burke's Chemical Manufactory, Cork, for a new Irish sheep dip. A number of English chemical companies usually take space at this exhibition but there was a reduction in the number this year owing to the tariffs on imported chemical goods. The chief stands in this class were occupied by Imperial Chemical Industries, Ltd., and the United Potash Co.

THERE WERE EXCITING SCENES at Cory's Wharf on the Thamesside at Erith on May 9, when an explosion at the works of Paper Makers Chemicals, Ltd., resulted in four men being taken to hospital. One man, whose clothes were alight, jumped into the river, which was at low tide, and sank into the mud up to his neck. Scores of men had arrived by this time, however, and with the aid of ropes were able to rescue him. The injured, who were all taken to Erith and District Hospital suffering from burns on the hands, arms and shoulders, were J. Todd, Charles Riding, Arthur Hamilton and Alfred Hamilton.

SET UP IN JANUARY LAST to consider and report whether any and if so what changes in the existing law and practice relating to trade marks are desirable, the Trade Marks Committee, under the chairmanship of Viscount Goschen, is continuing its meetings for the purpose of hearing evidence from interested persons and association. Seven meetings of the committee have taken place, and during the next few weeks evidence will be taken from representatives of the Trade Marks, Patents and Designs Federation, Ltd., the Trade Mark Owners' Association, Ltd., and the Chartered Institute of Patent Agents. Any persons or associations who desire to submit any further suggestions, or to give evidence, should notify their intention to the secretary to the committee, Mr. R. W. Luce, Industrial Property Department, Board of Trade, 25 Southampton Buildings, W.C.2, not later than June 3.

IN CONNECTION with the twenty-fifth anniversary of the American Institute of Chemical Engineers, a brochure has been issued by the Institute, entitled "The Silver Anniversary of Chemical Engineering in America," which discusses the rise of chemical engineering as an organised profession in the United States during the last quarter of a century. The principal chapters are (a) "Chemical Engineering as a Profession," contributed by a number of well-known members of the American Institute; (b) "Chemical Engineering Education," by Professor A. H. White; and (c) "Chemical Engineering Research—Life-blood of American Industry," by Dr. A. D. Little. Members of the institution may obtain copies of this publication at the same special rate as members of the American Institute, viz., 59c. per copy. Application for such copies should be addressed to the hon. secretary, who will forward the complete list of requests to the American Institute at the end of the month.

WITH THE ARRIVAL of consignments of raw sugar from Cuba work has recommenced at the Beet Sugar Refinery, Preston Hall, Fifeshire.

MR. ARTHUR EDWARD ERNEST KING, of Compton, near Wolverhampton, late foreign manager for Mander Brothers, paint and varnish manufacturers, of Wolverhampton, has left gross estate of the value of £59,598, with net personalty £54,149.

MR. JOHN LEISHMAN has retired after 58 years' service with the North British Rubber Co., Ltd., Edinburgh. When the Master and Wardens of the Patternmakers' Company of the City of London visited Edinburgh in 1922 they conferred honorary membership on him.

PRINCE GEORGE paid an informal visit to Warrington this week while on his way to Irlam, and made a tour of inspection of the works of the British Aluminium Company, and the works of Joseph Crosfield and Sons, Ltd.

THE DUKE OF YORK witnessed blasting operations at the Luxton Central Quarry of Imperial Chemical Industries (Lime), Ltd., on May 3. Only 33 cwt. of ammonal, which is a product of Imperial Chemical Industries, Ltd., were used for blasting a total of 32,000 tons of limestone rock. The preparation for the blasting has been carried on for more than a month.

IN THE COMPANIES WINDING-UP COURT, Chancery Division, on May 8, Mr. Justice Eve had before him a petition for compulsory winding up of Electro-Chemical Installations, Ltd. Counsel said the position was that the company had come to an agreement with regard to the petitioning creditors' debt, but that there were terms with regard to a guarantee to be executed. The mater was adjourned for 21 days for this to be carried out.

COMPETITORS in the Chemical Industry Lawn Tennis Tournament are asked to note that R. C. Vander, of Borax Consolidated, Ltd., who was to have partnered R. C. Mugridge in the men's doubles, found it necessary at the last moment to drop out of the tournament, and his place has been taken by L. R. Fradin. There was also a spelling error in last week's announcement of the draw, the name of L. F. Grape's partner being A. F. Childs, and not F. C. Childs, as printed.

AT A MEETING held at Bristol, Dr. Ernest Vanstone was elected chairman of the Bristol and South-Western Counties Section of the Institute of Chemistry. Dr. Vanstone has had a wide experience of chemistry, having held important appointments at Caerleon College (Monmouth), H.M. Explosives Factory (Pembrey, Carm.), and at the British Dyestuffs Corporation. During the last seven years he has been the head of the chemical department at Seale-Hayne Agricultural College, Newton Abbot, and has also taken an active interest in local affairs.

AN INVESTIGATION is being carried out by the Irish Free State Department of Industry and Commerce to determine the possibilities of producing industrial alcohol on a large scale in that country. The scheme proposes that molasses, a waste product of the beet sugar factories (now being used as a cattle food), should be utilised together with surplus grain and other agricultural products of the Free State. It is also suggested that an admixture of home-produced industrial alcohol with petrol should be made mandatory by law in order to reduce the country's imports of petroleum spirit.

IT IS OFFICIALLY ANNOUNCED that, after lengthy negotiations, arrangements were completed whereby control of Boots Pure Drug Co., Ltd., passed into British hands by the acquisition of 1,000,000 ordinary shares of £1 each in the company from the United Drug Co., the American holders. The shares have been strongly placed among leading insurance companies, banks, trust companies and financial houses throughout the country at the price of £6 15s. per share, cum. the bonus of 1s. per share (tax free), just announced. Boots Pure Drug Co., which was formed in 1888, controls the Boots Cash Chemists retail shops. The capital amounts to £2,900,000 of which £1,500,000 is in ordinary shares of £1 each.

THE ASSOCIATION OF SCIENTIFIC WORKERS, in collaboration with the Rubber Growers' Association, and the Research Association of British Rubber Manufacturers, is engaged on the production of a "Handbook of the Physical and Chemical Properties of Rubber." Such a handbook will be valuable to the manufacturer and user of rubber goods. The handbook will comprise approximately, 400 pages, and will consist of about nine sections, including a brief description of raw materials, processes of manufacture, products, etc., physical and chemical properties, properties of commercial types of rubber, accepted methods of analysis and testing, index to specifications for rubber goods, bibliography of works of reference in regard to rubber production, rubber manufacture, rubber science and rubber testing, and a list of British and foreign associations connected with the rubber industry.

THE PLAN FOR THE REORGANISATION of the Chilean nitrate industry has now been completed by the Minister of Finance. The scheme provides for the setting up of a selling consortium and for State participation in the profits, instead of the present nitrate export duty. The State share for 1933 is estimated at 140,000,000 pesos (approximately £2,500,000). The loans service will be organised with a view to avoiding encumbering the cost of production. Furthermore, the Minister of Finance is studying a new method of nitrate extraction which would, it is stated, make possible a considerable reduction in the price of nitrate. Some experts think the new method would make it possible to sell natural nitrate at lower prices than artificial nitrate.

PROFESSOR E. C. C. BALY was the speaker at the annual meeting of the Notts. and Derby Section of the British Association of Chemists, held at King's Cafe, Derby, last week. He spoke of the efforts which he and his helpers at the University of Liverpool are making to make certain discoveries relating to plant life. The business meeting preceded the address and discussion, and the hon. secretary of the section presented a report on a successful year. The officers were elected as follows: Chairman, Mr. E. A. Chapman; hon. treasurer, Mr. W. B. Miller; hon. secretary, Mr. J. Allan; committee, Messrs. A. Betesta, S. B. Bratley, J. W. Fisher, J. C. Hibbert, J. Sister, T. Ockman, J. P. Rogers, S. Spray, F. Stanbridge, J. Turnbull and H. Woods.

A CAPITAL PAYMENT of £20,000 promised to the Royal Institution by the Rockefeller Foundation nearly three years ago, on condition of obtaining £50,000 from other sources, has now been received. The gift was promised for endowment of research in the Davy Faraday Research Laboratory of the Royal Institution, and the fulfilment of the Rockefeller promise implies that in the past three years the managers have been successful in securing research endowment for the laboratory to a total capital value of upwards of £70,000. Payments in connection with the reconstruction of the Institution have been completed, and donations and receipts from other sources for rebuilding purposes amount to £93,000. The Institution has thus, in the space of three or four years, since the programme of reconstruction and re-equipment was begun, acquired new funds for the joint purposes of rebuilding and research endowment in excess of £163,000.

THE 15TH ANNUAL GENERAL MEETING of the London Section of the British Association of Chemists will be held on May 19, at 7.15 p.m. at the Broad Street Station Restaurant, followed by a smoking concert. Further information and tickets may be obtained from the General Secretary, British Association of Chemists, "Empire House," 175 Piccadilly, London, W.1. The annual general meeting of the Birmingham Section will be held on May 30, at 7.30 p.m. at the Birmingham Chamber of Commerce. Further information may be obtained from Mr. R. A. V. Tayar, 23 Wheatsheaf Road, Edgbaston, Birmingham. The annual general meeting of the Manchester Section, will be held at the Clarion Cafe, Market Street, Manchester, on May 31, at 8 p.m. Further information may be obtained from Dr. J. Avery, 55 Polefield Road, Heaton Park, Manchester.

THE IMPORT DUTIES ADVISORY COMMITTEE has received applications for increase of import duty on glass bottles, glass jars, and other glass containers (including glass stoppers or glass covers belonging to them, imported therewith), whether finished or not, including blanks for the production of such articles, glass tubes, rods and bar, plate and sheet glass, and articles made wholly or partly of such glass. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than June 8. The committee has decided not to make any recommendations in respect of applications for the imposition of additional duties on rice starch and compounds thereof, and the removal from the free list of peroxide of manganese, whether ground or granulated, and for the imposition of an additional duty upon it.